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WOODWARD-CLYDE CONSULTANTS PLYMOUTH MEETING PA
NATIONAL DAM INSPECTION PROGRAM. NEW KERNSVILLE DAM (NDS ID NUM--ETC(U)
JUL 79 J BOSCHUK, J H FREDERICK

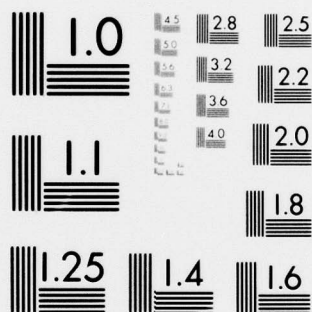
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⑩ John / Boschuk, Jr.
John Henry / Fredrick, Jr

DELAWARE RIVER BASIN

NEW KERNSVILLE DAM, BERKS COUNTY,
PENNSYLVANIA

NDS I.D. NO. PA 00723
DER I.D. NO. 6-434

Number

⑥

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

Number

New

Kernsville Dam (NDS ID PA-00723,
DER ID 6-434), Delaware River Basin,
Schuylkill River, Berks County,
Pennsylvania

Phase I Inspection
Report



⑮) DA 2W32-79-C-0017

Prepared by:

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Submitted to:

DEPARTMENT OF THE ARMY
Baltimore District, Corps of Engineers
Baltimore, Maryland 21203

⑪

JUL 1979

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PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams for Phase I Investigations. Copies of these guidelines may be obtained from the Office of the Chief of Engineers, Washington, D. C., 20314. The purpose of a Phase I investigation is to expeditiously identify those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify the need for more detailed studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through frequent inspections can unsafe conditions be detected, and only through continued care and maintenance can these conditions be prevented or corrected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the spillway design flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. The spillway design flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

Name of Dam: New Kernsville Dam
County Located: Berks County
State Located: Pennsylvania
Stream: Schuylkill River
Coordinates: Latitude 40° 34.4'
Longitude 76° 0.1'
Date of Inspection: (20 April 1979)

The New Kernsville Dam is owned by the State of Pennsylvania, under the jurisdiction of the Department of Environmental Resources, Office of Resource Management. The dam built under Pennsylvania Act 441 entitled "Schuylkill River Act", was completed in November 1949. Visual inspection of the exposed sections of the dam and review of the limited available data indicate that New Kernsville Dam is in good condition. It is to be noted that ^{since} the entire spillway and bucket were submerged and could not be inspected, therefore, a complete visual assessment of the structure could not be performed. The factors of safety for the ogee section appear to be reasonable. The dam is classified as a "High" hazard potential structure consistent with its potential to cause extensive property damage and possible loss of life in the event of abrupt failure. The dam is classified as an "Intermediate" size structure by virtue of its 43.88 foot height above the downstream apron.

The hydrologic and hydraulic calculations presented in Appendix C indicate the dam will pass more than 0.5 PMF but less than 1.0 PMF without overtopping. Therefore, the spillway system is considered to be "Inadequate" but not "Seriously Inadequate".

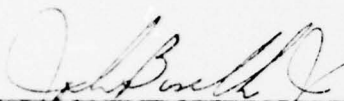
As the spillway forms the major portion of the structure and is underwater, the inspection was limited to the exposed portions. Those exposed portions included both abutments and the embankment section on the right side of the dam. These features were assessed to be in good condition.

Based on the findings presented in this report, it is recommended that the bucket area along the downstream toe of the spillway should be periodically inspected, especially after periods of high flows to check for scour or deterioration of the toe. Joint deterioration at monolithic sections

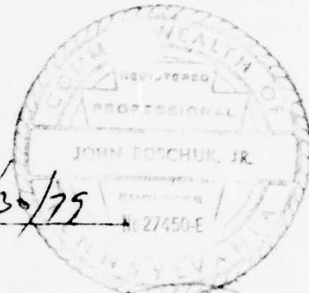
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and below the walkway and nonoverflow section should be periodically inspected. If deterioration of these zones becomes excessive, they should be cleaned and patched.

Since the Owner does not have a formal operation and maintenance procedure, one should be developed for this structure. This procedure should include a checklist to be used during periodic inspections to insure that all critical items are carefully inspected and maintained in the best possible condition. Since there is no formal warning procedure for this structure, one should be developed so downstream residents are adequately warned during periods of high flow.

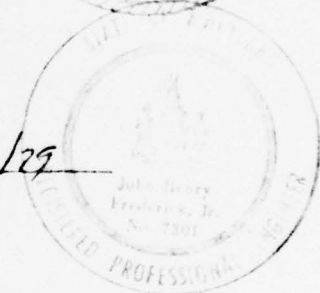

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Pennsylvania Registration 27450E
Woodward-Clyde Consultants

7/30/79
Date

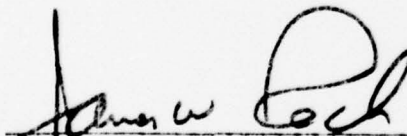



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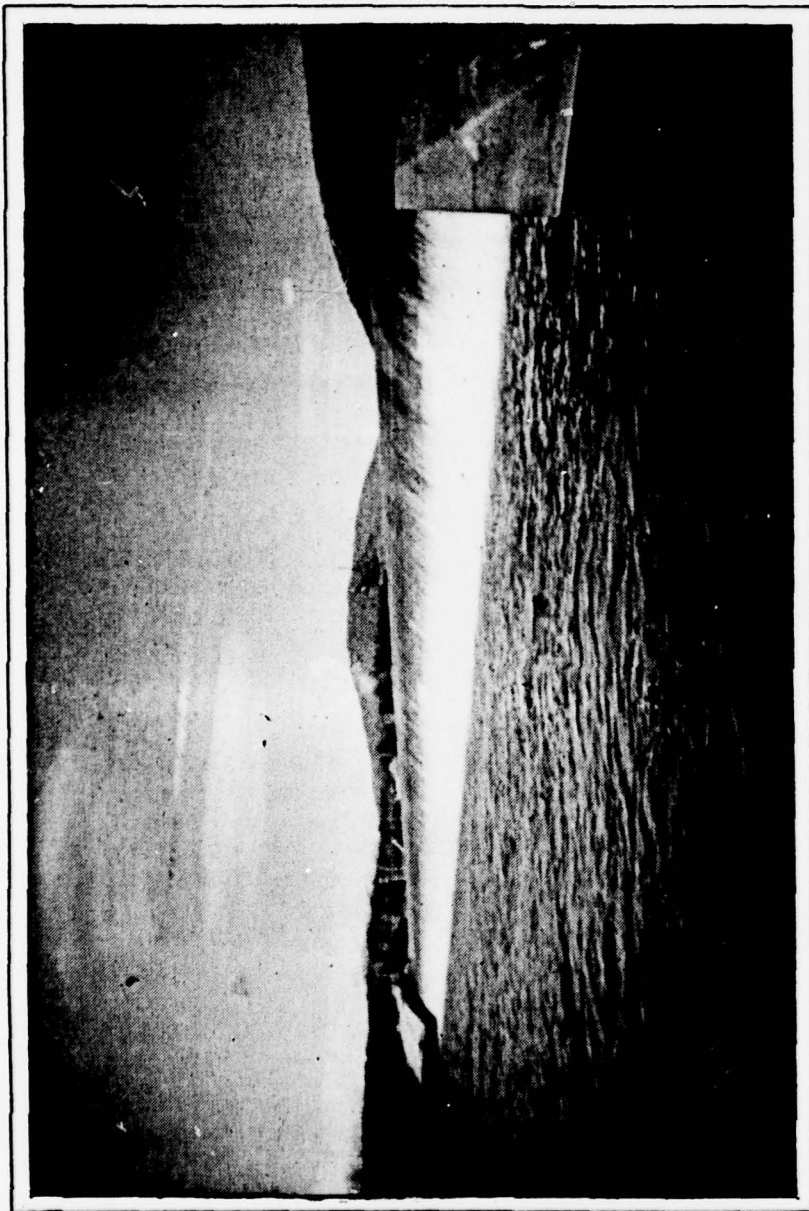
7/30/79
Date



APPROVED BY:


JAMES W. PECK
Colonel, Corps of Engineers
District Engineer

11 Sep 79
Date



OVERVIEW
NEW KERNSVILLE DAM, BERKS COUNTY, PENNSYLVANIA

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PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM
NEW KERNSVILLE DAM
NATIONAL ID #PA 00723
DER #6-434

SECTION 1
PROJECT INFORMATION

1.1 General.

a. Authority. The Dam Inspection Act, Public Law 92-367, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a program of inspection of dams throughout the United States.

b. Purpose. The purpose of the inspection is to determine if the dam constitutes a hazard to human life or property.

1.2 Description of Project.

a. Dam and Appurtenances. New Kernsville Dam is a "run of the river" dam with limited storage capacity across the Schuylkill River. It is a concrete gravity structure with a central 600 foot ogee spillway section and a nonoverflow section at each end of the spillway. A 260 foot earth embankment joins the right nonoverflow section to the abutment. The overall length of the dam is 1,600 feet.

The ogee gravity spillway has a base width of 58.6 feet and a total height from the foundation to the crest of the nonoverflow section of 45 feet. The height of the spillway crest above the stream bed is about 33 feet. The bucket at the downstream toe of the spillway has a radius of 15 feet and a thickness of 5 feet, extending 16 feet downstream from the toe of the dam. The height of the nonoverflow section above the downstream apron is 44.88 feet. The dam foundation was grouted with holes extending 25 feet below the foundation on 5 foot centers.

The gravity nonoverflow sections at each end of the spillway have a width of 8 feet for the top 10.5 feet. Below this elevation, the downstream base batters at 7 on 10 and the upstream base has a batter of 1 on 20. Beyond the ends of the nonoverflow sections are earth embankments which tie the nonoverflow sections to natural ground. The earth embankment sections have a top width of about 30 feet consisting of about

11 feet of earth and 19 feet of rock. Both faces of the embankment have slopes of 3H:1V. The upstream face is protected with rock fill up to four feet thick and the downstream face with rock fill up to two feet thick. The upper portion of the embankment is reported to consist of impervious materials and the downstream portion to consist of a more pervious fill. The embankments are also reported to contain a centerline core trench excavated to rock. The core trench has a base width of 15 feet and side slopes of 1H:1V.

b. Location. The dam is located on the Schuylkill River, approximately 1.5 miles north of Hamburg, in Windsor Township, Berks County, Pennsylvania. The site is shown on USGS Quadrangle entitled "Auburn, Pennsylvania" at coordinates N 40° 34.4' W 76° 0.1'. A regional location plan of New Kernsville Dam is enclosed as Plate 1, Appendix E.

c. Size Classification. The dam is classified as an "Intermediate" size dam by virtue of its 45 foot height and estimated 1,850 acre-foot total storage capacity.

d. Hazard Classification. A "High" hazard classification is assigned consistent with the potential for extensive property damage and possible loss of life along the Schuylkill River downstream of the dam.

e. Ownership. The dam is owned by the Department of Environmental Resources (DER), Office of Resource Management. All correspondence should be sent to Mr. Samuel R. Reed, Director, Bureau of Operations, Office of Resource Management, Department of Environmental Resources, Post Office Box 1467, Harrisburg, Pennsylvania 17120.

f. Purpose of Dam. The purpose of this dam is to create a desilting basin.

g. Design and Construction History. New Kernsville Dam was constructed as a result of Pennsylvania Act 441, "Schuylkill River Desilting Project", June 1945. New Kernsville Dam is one of a series of several dams along the Schuylkill River constructed to form desilting basins to trap coal sediment carried by the river.

Foundation investigations began September 3, 1947, with Sprague & Henwood, Incorporated. Completion date for the test borings was February 11, 1948. Justin & Courtney*, Philadelphia, Pennsylvania, designed the dam, which was constructed by Poirier & McLane Corporation under a Pennsylvania GSA (Department of General Services) Contract No. 100-1.

* Justin & Courtney is now a division of O'Brien & Gere, Syracuse, New York.

Subsurface grouting was done by the Pennsylvania Drilling Company of Pittsburgh, Pennsylvania. Construction began June 1948, and was completed by November 10, 1949.

The dam was constructed in two stages by use of coffer dams and earth dikes. The left half of the dam was constructed first with diversion on the right side. During the second stage of construction, the river was diverted by means of three 4 x 5 foot conduits with concrete stoplogs to facilitate closure after construction. Several post-construction photographs were available for review in the final report prepared by the Schuylkill River project engineers, dated July 1, 1951. There were no construction photographs or construction reports available in DER files.

h. Normal Operating Procedures. All water flows over the weir of the spillway. Flood water storage capacity is minimal compared to the size of the drainage area. In the event spillway capacity is exceeded and the dam is overtopped, no damage would result. According to a memorandum dated March 12, 1948, from the Chief, Division of Dams, the overflow sections could be overtopped without serious damage. Mr. Courtney of Justin & Courtney confirmed that the dam could be overtopped without serious damage.

1.3 Pertinent Data.

A summary of pertinent data for New Kernsville Dam is presented as follows.

a.	Drainage Area (sq miles)	340
b.	Discharge at Dam Site (cfs)	
	Maximum Known Flood (Tropical Storm Agnes, 1972, measured at downstream gaging station)	42,800
	At Top of Nonoverflow Section	83,400
c.	Elevation (feet above MSL)	
	Top of Dam	393.88
	Spillway Crest	383.0
	Downstream Apron (toe)	350.0
	Normal Pool	383.0
d.	Reservoir (miles)	
	Length at Normal Pool	1.25
	Fetch at Normal Pool	0.60

e.	Storage (acre-feet)	
	Normal Pool	583
	At Top of Nonoverflow (est.)	1,260
f.	Reservoir Surface (acres)	
	Normal Pool	54
g.	Dam Data	
	Type	Concrete gravity
	Length	1,600 feet
	Height (above downstream apron)	43.88 feet
	Crest Width (concrete nonoverflow section)	8 feet
	Volume	
	Concrete	45,000 cu yds
	Earth/Rock	7,000 cu yds
	Cutoff	Concrete sections founded in rock
	Grout Curtain	Upstream single line grout curtain
h.	Spillway	
	Type	Concrete ogee weir
	Elevation	383 feet
	Length	599.8 feet

SECTION 2 ENGINEERING DATA

2.1 Design.

a. Data Available. A summary of engineering data for New Kernsville Dam is presented in the checklist attached as Appendix A. Principal documents containing pertinent data used for this report include the "Report Upon the Application of the Water and Power Resources Board" dated April 21, 1948, the "Final Report of the Schuylkill River Project Engineers" dated July 1, 1951, and drawings supplied by the Bureau of Completed Projects, Schuylkill River Office. Other data used to review the engineering characteristics of the dam include the "Water Resources Bulletin", Bulletin No. 4, prepared for the Commonwealth of Pennsylvania by E. H. Bourquard & Associates, dated March 1968, as well as correspondence, inspection reports and miscellaneous memorandums. There were no design evaluations available for this inspection, but there were a few hand written calculations in Department of Environmental Resources' (DER) files, which show that the nonoverflow section is stable against overturning and sliding. Hydrologic computations are presented in Appendix C of this report and discussed in Section 5.

b. Design Features. Principal design features are illustrated on plan, profile and cross-section plates of the structure and are enclosed in Appendix E as Plates 2 through 6. These plates are reproduced from drawings supplied by the Bureau of Completed Projects, Pennsylvania. A description of the design features is presented in Section 1.2, entitled "Description of Project".

2.2 Construction.

A description of the construction history is presented in Section 1.2.

2.3 Operational Data.

There are no operational records maintained. Since all flow passes over the overflow section, there are no minimum flow requirements downstream.

2.4 Evaluation.

a. Availability. All engineering data reproduced in this report and studied for this investigation were provided by the Pennsylvania DER and Justin & Courtney.

b. Adequacy. The data included in State files and information received from representatives of the Office of Resource Management were sufficiently adequate to evaluate the design features of the dam and appurtenant structures in accordance with Phase I guidelines.

c. Validity. There is no reason to question the validity of the available data.

SECTION 3 VISUAL INSPECTION

3.1 Findings.

a. General. Observations and comments of the field inspection team are contained in the checklist enclosed herein as Appendix B, and are summarized and evaluated as follows. In general, the ogee section, nonoverflow sections and earthen section of the facilities appear to be in good condition and well maintained. At the time of the inspection, the river was flowing at a normal rate over the spillway and, thus, the ogee section and downstream bucket of the spillway could not be inspected.

b. Dam. The earthen end section of the dam was inspected and found to be in good condition. Portions of the embankment have been backfilled and are currently used as a parking area. Other areas are densely vegetated with small trees. Derrick stone on both the upstream and downstream slopes is in excellent condition, as shown in Photographs 4, 7 and 8 of Appendix D. It was noted that smaller pieces of rock between the derrick stone near the water had been removed by vandals. Along the downstream section of the left embankment, some debris has accumulated in the backwater between the spillway retaining wall and the toe of the dam. This is readily seen in Photograph 4. Since the Schuylkill River is adjacent to the downstream toe of the embankment sections and the section is protected with derrick stone, seepage, if any, could not be observed.

c. Appurtenant Structures.

1. Ogee Spillway. The exposed portions of the ogee spillway were limited to the retaining walls of the structure. These retaining walls are in good condition with no significant cracks or deterioration. Water flowing over the spillway crest was smooth with no indications of cracks or displacements between monoliths.

2. Nonoverflow Sections. Nonoverflow sections at each abutment were inspected and found to be in good condition, as shown in Photographs 2, 5 and 6. Some minor cracking and joint deterioration is occurring, as shown in Photographs 9 and 10, but this has no effect on the structural integrity of the section.

d. Reservoir. At the time of the inspection, the impounding area was at normal pool, and slopes to the water's

edge are well vegetated and stable. Based on the latest soundings, it is reported that the pool is less than 30 percent filled with silt.

e. Downstream Channel. The natural channel below the dam is the Schuylkill River, which appears to be in good condition with stable banks and a minimum amount of scour. The condition of the downstream channel below the dam was compared with an overview photograph taken in February 1948. A comparison between the 1948 overview photograph and this recent inspection indicates that some sediment has occurred downstream of the dam.

3.2 Evaluation.

Inspection of the dam and appurtenant facilities disclosed no evidence of apparent past or present movement that would indicate existing instability of the concrete section of the dam. Since flow was passing over the spillway at the time of the inspection, the toe of the spillway could not be inspected for undermining, scour or the condition of the bucket section. All exposed structural features of the dam were observed to be in very good condition.

SECTION 4 OPERATIONAL PROCEDURES

4.1 Procedures.

Operation of the dam does not require a dam tender. All flow discharges directly over the ogee section and downstream into the Schuylkill River. The dam was not designed to impound water, but to impound silt.

4.2 Maintenance of the Dam.

The dam is maintained by the Department of Environmental Resources (DER), Office of Resource Management. Mr. Joseph Bullenger, dredging operations supervisor for the DER, indicates the dam is periodically inspected and debris is removed, and painting and other work is performed as necessary.

4.3 Maintenance of Operating Facilities.

There are no mechanical devices or operating devices to maintain for this structure.

4.4 Warning Systems In Effect.

According to DER's representative during the time of the inspection, there are no formal written warning procedures associated with New Kernsville Dam.

4.5 Evaluation.

Since there are no operating facilities and since the dam does not require a dam tender, it is judged that the current operating procedure is a satisfactory method of operating the dam. Since a warning procedure has not been established, it is recommended that one should be established.

SECTION 5 HYDROLOGY/HYDRAULICS

5.1 Evaluation of Features.

a. Design/Evaluation Data. No original design data was located. Some evaluation data was available in State files and additional calculations for this investigation are presented in Appendix C.

The watershed is large, about 33 miles long and 13 to 24 miles wide, having a total area of 340 square miles. Elevations range from 1,757 in the upper reaches to 383 at the weir elevation. This portion of the Schuylkill River Watershed has higher average rainfall and steeper topography, producing a higher runoff, than the lower portions of the river. About 1.8 miles above the dam, the river divides into the Schuylkill and Little Schuylkill. Throughout the watershed are over 30 dams, of which 15 impound a significant quantity of water. The largest dam is the first upstream dam on the Schuylkill, the Auburn Dam. Large upstream dams on the Little Schuylkill are Still Creek Reservoir and Little Schuylkill flood control dam.

The total drainage area is less than 25 percent developed, is 10 percent or more strip mined, and more than 55 percent wooded. It is not expected that runoff characteristics will change significantly in the near future.

Undated calculations in State files evaluated the peak spillway discharge to be 80,200 cfs. The tailwater level would be 0.5 feet above the weir. The discharge was compared to the maximum known discharge at about 4.5 miles below the dam. The spillway discharge was about three times the maximum known flood (24,000 cfs) and was considered adequate by the State. A March 12, 1948 memo in the files stated the structure was capable of withstanding overtopping without serious damage.

In accordance with criteria established by Federal (OCE) Guidelines, the recommended spillway design flood for this "Intermediate" size dam and "High" hazard classification is the Probable Maximum Flood (PMF).

b. Experience Data. Reservoir water levels are not routinely maintained for this dam although maximum levels have been recorded. Hurricane Diane, August 1955, crested at 2 a.m., August 19, at seven feet over the weir crest. The estimated discharge at the downstream gaging station was

29,400 cfs. Tropical Storm Agnes, June 1972, produced the present high water level, about seven feet over the weir with an estimated discharge at the downstream gaging station of 42,800 cfs. Rainfall records are not maintained by the Owner in the vicinity of the dam, but there are four National Weather Service Gages within the watershed.

c. Visual Observations. On the date of the inspection, there were no conditions observed that would indicate a reduced spillway capacity during an extreme event. Observations regarding the condition of the downstream channel, spillways and reservoir are located in Appendix B and discussed in greater detail in Section 3.

d. Overtopping Potential. This structure creates a very small reservoir and during a large storm, little attenuation of the inflow hydrograph is expected. During large storms greater than 0.5 PMF, it is expected that the tailwater would be near or higher than the weir crest. This structure was evaluated by the use of the "HEC-1, Dam Safety Version" computer program. A brief description of the program is included in Appendix C. Because of the large watershed with several significant size dams, the inflow hydrograph is only approximate and conservative. The overtopping potential has been evaluated by comparing inflow hydrograph peaks with the spillway capacity, neglecting any tailwater effects.

The computed peak PMF inflow is 140,484 cfs, significantly greater than the spillway capacity of 87,500 cfs determined for this study. The 0.5 PMF inflow value, 70,242 cfs, is less than the spillway capacity.

e. Spillway Adequacy. As the spillway will pass more than 0.5 PMF without overtopping the structure, the spillway is rated as "Inadequate".

f. Downstream Conditions. The nearest homes are about 500 feet below the dam. These three houses are built adjacent to the river and subject to damage in the event of high flows. It is noted that portions of these homes and property were flooded during Tropical Storm Agnes and Hurricane Diane. About 3,000 feet farther downstream are four more homes subject to damage. About 1.5 miles below the dam are low lying areas of Hamburg and West Hamburg, which are subject to damage in the event of large flows. If the dam were to fail, not as a result of overtopping during an extreme event, extensive property damage and loss of life would occur, justifying a "High" hazard potential rating.

SECTION 6 STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability.

a. Visual Observations. Visual observations detected no evidence of existing or pending instability of the structure. All exposed items of the structure were inspected and found to be in good condition. There was no distortion along the spillway crest to infer excessive scour downstream, monolith displacement or structural deterioration of the ogee section. However, the entire ogee section was covered with water and could not be thoroughly inspected. The nonoverflow sections were found to be in good condition. In some cases, large spaces were noted between the derrick stone on the downstream sections of the embankment portion, most likely as a result of vandalism, but it is judged that this would not have a significant effect on the stability of the structure in the event it is overtopped.

b. Design and Construction Data. All available design and construction data are presented in Section 1 of this report. As noted in Section 2, stability analyses were available and reviewed. The calculations indicate that the structure is stable with satisfactory factors of safety against overturning and sliding. There was no other detailed design data or construction documentation available from Department of Environmental Resources' files.

c. Operating Records. There are no operational records for this structure.

d. Post-Construction Changes. Since the completion of construction in 1948, there have been no modifications made to this dam.

e. Seismic Stability. The dam is located in Seismic Zone 1. Normally it can be considered that if a dam in this zone is stable under static conditions, it can be assumed safe for any expected earthquake conditions. As the static stability analysis for this structure appears to satisfy Corps of Engineers criteria, it also appears that the seismic stability would satisfy Corps of Engineers criteria.

SECTION 7 ASSESSMENT/REMEDIAL MEASURES

7.1 Dam Assessment.

a. Evaluation. Visual inspection of the exposed sections of the dam and review of the limited available data indicate that New Kernsville Dam is in good condition. It is to be noted that the entire spillway and bucket were submerged and could not be inspected. Therefore, a complete visual assessment of the structure could not be performed. The static stability calculations were reviewed and the factors of safety appear to be satisfactory. Hydrologic and hydraulic computations presented in Appendix C indicate the structure will pass between 0.5 and 1.0 of the Probable Maximum Flood without overtopping. Therefore, the spillway system for this structure is considered to be "Inadequate". In the event the dam fails, not during an extreme event, high flows are expected along the Schuylkill River, which could cause extreme property damage and possible loss of life.

b. Adequacy of Information. Information available for this investigation was sufficiently adequate to evaluate the dam and appurtenant structures in accordance with Phase I Inspection criteria. There was not enough of the structure exposed to perform a complete visual inspection.

c. Urgency. The recommendations presented in the following section should be implemented as soon as practical.

7.2 Remedial Measures.

a. Facilities. The bucket area along the downstream toe of the spillway should be periodically inspected, especially after periods of high flows to check for scour or deterioration of the downstream toe. Joint deterioration at monolithic sections and below the walkway and nonoverflow section should be periodically inspected. If deterioration of these zones becomes excessive, they should be cleaned and patched.

b. Operation and Maintenance Procedures. Since the Owner does not have a formal operation and maintenance procedure, one should be developed for this structure. Since there is no formal warning procedure for this structure, one should be developed to warn downstream residents of pending high flows.

APPENDIX

A

NAME OF DAM Kernsville Dam
ID # PA 00223

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
PHASE I

Sheet 1 of 4

ITEM	REMARKS
AS-BUILT DRAWINGS	None available in DER files.
REGIONAL VICINITY MAP	See Plate 1, Appendix E.
CONSTRUCTION HISTORY	Not available in DER files.
TYPICAL SECTIONS OF DAM	Not available in DER files.
OUTLETS - PLAN	} } }
DETAILS	
CONSTRAINTS	
DISCHARGE RATINGS	} }
RAINFALL/RESERVOIR RECORDS	

Not available in DER files.

Not available in DER files.

ITEM	REMARKS
DESIGN REPORTS	Not available in DER files.
GEOLOGY REPORTS	See data presented in Appendix F prepared for this 1979 inspection.
DESIGN COMPUTATIONS HYDROLOGY & HYDRAULICS DAM STABILITY SEEPAGE STUDIES	<div> <div>See Appendix C.</div> <div>Not available in DER files.</div> </div>
MATERIALS INVESTIGATIONS BORING RECORDS LABORATORY FIELD	Unknown or not available.
POST-CONSTRUCTION SURVEYS OF DAM	Not available.
BORROW SOURCES	

ITEM	REMARKS
MONITORING SYSTEMS	None.
MODIFICATIONS	None.
HIGH POOL RECORDS	Unknown.
POST CONSTRUCTION ENGINEERING STUDIES AND REPORTS	Unknown.
PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS	None.
MAINTENANCE OPERATION RECORDS	Not available.

ITEM	REMARKS
SPILLWAY PLAN	Plans not available in DER files.
SECTIONS	
DETAILS	
OPERATING EQUIPMENT PLANS & DETAILS	Not available.
MISCELLANEOUS	<ol style="list-style-type: none"> 1. Application" dated 14 April 1948. 2. "Permit" dated 21 April 1948. 3. "Report Upon the Application of the Water and Power Resources Board" dated April 21, 1948. 4. Inspection Reports by the Schuylkill River Project Engineers 1954 through 1960. 5. DER Inspection Report dated April 17, 1970.

APPENDIX

B

CHECK LIST
VISUAL INSPECTION
PHASE I

Sheet 1 of 11

Name Dam Kermerville Dam County Berks State Pennsylvania National ID # PA 00723
Type of Dam Concrete Hazard Category I-High
Date(s) Inspection 20 April 1979 Weather Clear & Cool Temperature 50's

Pool Elevation at Time of Inspection 381 ± M.S.L. Tailwater at Time of Inspection Unknown M.S.L.

Inspection Personnel:

John Boschuk, Jr. (Geotechnical) Raymond Lambert (Geologist) John H. Frederick (Geotechnical)

Mary F. Beck (Hydrologist) Vincent McKeever (Hydrologist)

John Boschuk, Jr. Recorder

Remarks:

Messrs. Joseph Bullinger, Dredging Operations Supervisor and Clifford Romig, Engineer
from the State of Pennsylvania were on site and provided assistance.

CONCRETE/MASONRY DAMS

Sheet 2 of 11

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
ANY NOTICEABLE SEEPAGE	<i>None observed.</i>	
STRUCTURE TO ABUTMENT/EMBANKMENT JUNCTIONS	<i>Excellent condition.</i>	
DRAINS	<i>None known.</i>	
WATER PASSAGES	<i>None</i>	
FOUNDATION	<i>Could not be inspected.</i>	

CONCRETE/MASONRY DAMS

Sheet 3 of 11

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS CONCRETE SURFACES	<i>Very minor occasional spalling noted on exposed portion of the structure.</i>	
STRUCTURAL CRACKING	<i>None observed.</i>	
VERTICAL AND HORIZONTAL ALIGNMENT	<i>Could not be checked because of flow over the dam.</i>	
MONOLITH JOINTS	<i>Exposed joints were in good condition.</i>	
CONSTRUCTION JOINTS	<i>Exposed joints were in good condition.</i>	

EMBANKMENT

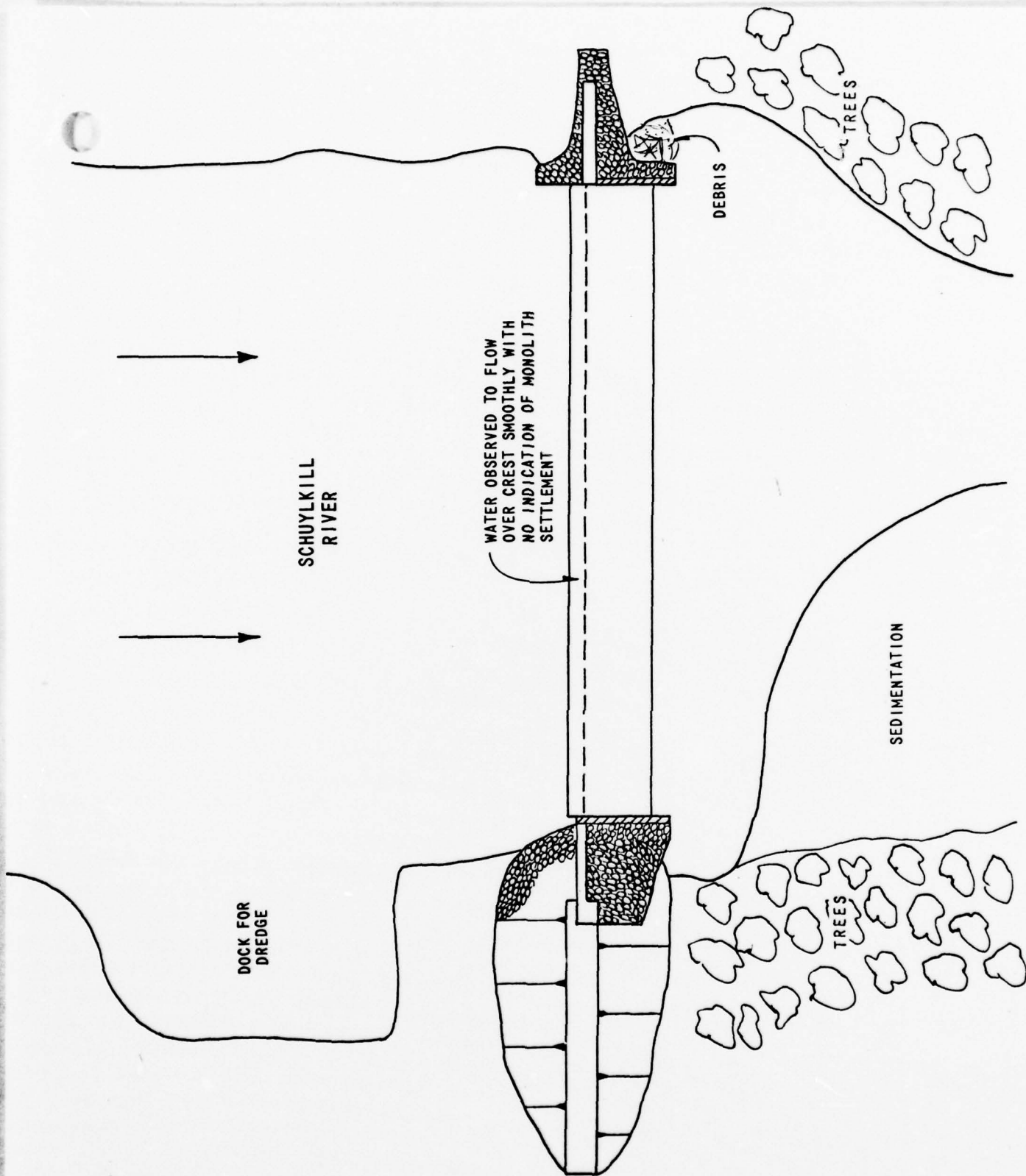
Sheet 4 of 11

<u>VISUAL EXAMINATION OF</u>	<u>OBSERVATIONS</u>	<u>REMARKS OR RECOMMENDATIONS</u>
SURFACE CRACKS	N/A	
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	N/A	
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	N/A	
VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST	N/A	
RIPRAP FAILURES	N/A	

EMBANKMENT

Sheet 5 of 11

<u>VISUAL EXAMINATION OF</u>	<u>OBSERVATIONS</u>	<u>REMARKS OR RECOMMENDATIONS</u>
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	N/A	
ANY NOTICEABLE SEEPAGE	N/A	
STAFF GAGE AND RECORDER	N/A	
DRAINS	N/A	



FIELD OBSERVATION PLAN
NEW KERNSVILLE DAM

SHEET 5A OF 11

OUTLET WORKS

Sheet 6 of 11

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	N/A	
INTAKE STRUCTURE	N/A	
OUTLET STRUCTURE	N/A	
OUTLET CHANNEL	N/A	
EMERGENCY GATE	N/A	

UNGATED SPILLWAY

Sheet 7 of 11

<u>VISUAL EXAMINATION OF</u>	<u>OBSERVATIONS</u>	<u>REMARKS OR RECOMMENDATIONS</u>
------------------------------	---------------------	-----------------------------------

CONCRETE WEIR	Full flow over crest. Spillway could not be inspected.	
---------------	--	--

APPROACH CHANNEL	N/A	
------------------	-----	--

DISCHARGE CHANNEL	Stable but the channel at the base of the spillway could not be inspected for erosion or undercutting.	
-------------------	--	--

BRIDGE AND PIERS	None	
------------------	------	--

GATED SPILLWAY

Sheet 8 of 11

<u>VISUAL EXAMINATION OF</u>	<u>OBSERVATIONS</u>	<u>REMARKS OR RECOMMENDATIONS</u>
CONCRETE SILL	N/A	
APPROACH CHANNEL	N/A	
DISCHARGE CHANNEL	N/A	
BRIDGE AND PIERS	N/A	
GATES AND OPERATION EQUIPMENT	N/A	

35

INSTRUMENTATION

Sheet 9 of 11

VISUAL EXAMINATION	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
MONUMENTATION/SURVEYS	None	
OBSERVATION WELLS	None	
WEIRS	None	
PIEZOMETERS	None	
OTHER	None	

RESERVOIR

Sheet 10 of 11

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
-----------------------	--------------	----------------------------

SLOPES

Side slopes are moderate to steep, wooded or brush covered.

SEDIMENTATION

Sedimentation was measured in 1973, reduced normal storage by about 17%, no effect on flood storage.

DOWNSTREAM CHANNEL

Sheet 11 of 11

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
-----------------------	--------------	----------------------------

CONDITION
(OBSTRUCTIONS,
DEBRIS, ETC.)

There are no major obstructions downstream of the dam. Normal river debris was noted along banks.

SLOPES

The valley gradient is about 0.0025.

APPROXIMATE NO.
OF HOMES AND
POPULATION

Immediately downstream are homes built in the flood plain. The first major town is Hamburg which is generally above elevation 340 and only the lower parts of the town flood during large storms.

APPENDIX

C

NEW KERNSVILLE DAM
CHECK LIST
HYDROLOGIC AND HYDRAULIC
ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: Large, mountainous, greater than 55% wooded,
25% developed and 10% strip mining.
ELEVATION TOP NORMAL POOL (STORAGE CAPACITY): 383 feet (583 Acre-Feet).
ELEVATION TOP FLOOD CONTROL POOL (STORAGE CAPACITY): 393.88 feet (1250[±] Acre-Feet).
ELEVATION MAXIMUM DESIGN POOL: -----
ELEVATION TOP DAM: 399.88 feet.

SPI LLWAY

- a. Elevation 383 feet.
b. Type Concrete ogee weir.
c. Width 600 feet.
d. Length -----
e. Location Spillover Central portion of structure.
f. Number and Type of Gates None.

OUTLET WORKS:

- a. Type Non-functional construction diversion conduits with
concrete stop logs.
b. Location -----
c. Entrance inverts 366.0 feet.
d. Exit inverts 360.34
e. Emergency draindown facilities None.

HYDROMETEOROLOGICAL GAGES:

- a. Type Four reporting National Weather Service Stations within the
watershed.
b. Location -----
c. Records National Weather Service.

MAXIMUM NON-DAMAGING DISCHARGE: Not determined.

40

HEC-1, REVISED
FLOOD HYDROGRAPH PACKAGE

The original "Flood Hydrograph Package" (HEC-1), developed by the Hydrologic Engineering Center, Corps of Engineers, has been modified for use under the National Dam Inspection Program. The "Flood Hydrograph Package (HEC-1), Dam Safety Version", hereinafter referred to as, HEC-1, Rev., has been modified to require less detailed input and to include a dam breach analysis. The required input is obtained from the field inspection of a dam, any available design/evaluation data, relatively simple hydraulic calculations, or information from the USGS Quandrangle maps. The input format is flexible in order to reflect any unique characteristics of an individual dam.

HEC-1, Rev. computes a reservoir inflow hydrograph based on individual watershed characteristics such as: area, percentage of impervious surface area, watershed shape, and hydrograph characteristics determined from regional correlation studies by the Corps of Engineers, Baltimore District. The inflow is routed through the reservoir using spillway discharge data obtained from the field inspection or design data. Flood storage capacity is determined from USGS maps or design information and verified by the field inspection. In the event a spillway cannot discharge 0.5 PMF without overtopping and failure of the dam, downstream channel characteristics obtained from the field inspection and USGS maps are inputted and flows are routed downstream to the damage center and a dam breach analysis is performed.

Included in this Appendix are the HEC-1, Rev. pertinent input values and a summary print-out tables.

BY MFB DATE 7/12/79

SUBJECT

SHEET 3 OF 8

CD. BY

DATE

New Kernsville Dam

JOB No.

Hydrology / Hydraulics

Classification (Ref - Recommended Guidelines for Safety Inspection of Dams)

1. The hazard potential is rated as "High" as there would be loss of life if the dam failed.
2. The size classification is "Intermediate" based on its 43.9 ft. height measured from end of downstream apron.
3. The spillway design flood, based on size and hazard classification, is the Probable Maximum Flood (PMF).

Hydrology and Hydraulic Analysis

1. Design/Evaluation Data. No original design data was available. The "Application Report" evaluated the spillway capacity as 80,200 cfs with a maximum depth of 10.88 ft. This was considered adequate. The maximum recorded discharge at the downstream gaging station at Berne, about 4.5 miles below the dam, was 24,000 cfs in 1942.

2. Evaluation of Structure.

New Kernsville Dam is a "run-of-the-river" dam with very little flood storage capacity, therefore, reservoir routing was not done, and the spillway adequacy was determined by comparing the inflow hydrograph with spillway capacity.

Inflow Hydrograph - determined by the computer program.

Computer input as follows:

drainage area - the design value verified from USGS 1:250,000 maps

rainfall, shown on sheet 7, ref. Hydrometeorological Report No. 33.

Snyder's hydrograph parameter, t_p , C_p

$$t_p = C_t (L^1 L_{ca})^{0.3}$$

$C_t = 1.35$ Information received from Corps of Engineers, Baltimore, for Zone 6.

$C_p = 0.40$

$L = 35.8$ mi. from USGS, 1:24000

$L_{ca} = 26.78$ miles

$$t_p = 1.35 (35.8 \cdot 26.78)^{0.3}$$

$$= 10.60$$

BY MFB DATE 7/12/79

SUBJECT New Kernsville Dam
Hydrology / Hydraulics

SHEET 4 OF 8

JOB No. _____

Spillway Capacity Ref. Chow, Open Channel

Hydraulics, p. 364

$$X^n = K H_d^{n-1} Y$$

H_d = design head excluding velocity head of approach

$n = 1.836$ for 1H:3V up face of weir

$K = 1.936$ " " " " "

Horz. Dist. ft.	X	Y	H_d
4' 0 1/2"	0	0	-
8' 1 1/8"	4.08'	9 3/4"	12.75
10' 9 3/4"	6.80'	1' 11"	14.03
13' 6"	9.58'	3' 5 5/8"	14.65

use $H_d = 14$ ft.

USBR, Design of Small Dams, p. 372

assume $C_o = 3.92$ $Q = 14^{3/2} \cdot 600 \cdot 3.92 = 123,200$ cfs

height of weir ~ 23 ft, ave. channel width ~ 800 ft

$n = 123,200 / (37 \times 600) = 5.5$ ft/sec

velocity head ~ 0.48 ft

H_o (design head) = 14.48 say 14.5 ft.

$C_o = 3.92 \cdot 0.97 = 3.80$ when pool is at top of non overflow section

maximum spillway capacity

$Q = 3.80 \cdot 600 \cdot 11.38^{3/2}$

$Q \sim 87,500$ cfs assuming weir is not submerged and velocity head is 0.5 ft.

Estimate of Tailwater Level

$S_o = 0.00417$ from Water Resources Bulletin No. 4 section about 700 ft downstream

Area ~ 7632 ft² w/ water level @ 383.0

W.P. ~ 716 ft from section estimated

from USGS map.

$$Q = A \frac{1.49}{n} R^{4/3} S_o^{1/2}$$

$$= 7632 \frac{1.49}{0.035} \left(\frac{7632}{716} \right)^{4/3} 0.00417^{1/2}$$

$$= 101,600 \text{ cfs}$$

therefore, weir is not expected to be submerged at max. spillway cap.

BY MEB DATE 7/16/79

SUBJECT _____

SHEET 5 OF 8

CHKD. BY _____ DATE _____

New Kernsville Dam

JOB No. _____

Hydrology / Hydraulics

Spillway Adequacy

As the spillway discharges more than 0.5 PMF but less than 1.0 PMF without overtopping the nonoverflow sections, the spillway is rated as "Inadequate" but not "Seriously Inadequate."

MFB

7/16/79

New Kernsville Dam Hydrology / Hydraulics

SH. 6 OF 8

1*****
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION JULY 1978
LAST MODIFICATION 26 FEB 79

RUN DATE* 79/07/12.
TIME* 06.13.46.

NEW KERNSVILLE DAM
NAT ID NO. PA 00723 DER NO. 6-434
INFLOW HYDROGRAPH

JOB SPECIFICATION									
NQ	NHR	NMIN	IDAY	IHR	IMIN	MEIRC	IPLT	IPRT	NSTAN
200	2	0	0	0	0	0	0	-4	0
			JOPER	NWT	LROPT	TRACE			
			5	0	0	0			

MULTI-PLAN ANALYSES TO BE PERFORMED
NPLAN= 1 NRTIO= 4 LRTIO= 1
RTIOS= .50 .80 .90 1.00

MFB

7/16/76

New Kernsville Dam
Hydrology/Hydraulics

ST. 7 OF 8

SUB-AREA RUNOFF COMPUTATION

INFLOW HYDROGRAPH

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
IN	0	0	0	0	0	1	0	0

HYDROGRAPH DATA

INHYD	IUNG	IAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	1	340.00	0.00	340.00	0.00	0.000	0	1	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.00	23.00	76.00	83.00	94.00	108.00	0.00	0.00

TRSPC COMPUTED BY THE PROGRAM IS .893

LOSS DATA

LROPT	STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0	0.00	0.00	1.00	0.00	0.00	1.00	1.00	.05	0.00	0.00

UNIT HYDROGRAPH DATA

TP= 10.60 CP= .40 NTA= 0

RECESSION DATA

STRIO= -1.50 ORCSN= -.05 RTIOR= 2.00

UNIT HYDROGRAPH 56 END-OF-PERIOD ORIGINATES, LAG= 10.60 HOURS, CP= .40 VOL= 1.00

565.	2107.	4263.	6390.	7849.	8189.	7639.	6912.	6254.	5659.
5121.	4634.	4193.	3794.	3433.	3106.	2811.	2543.	2301.	2082.
1884.	1705.	1543.	1396.	1263.	1143.	1034.	936.	847.	766.
693.	627.	568.	514.	465.	421.	381.	344.	312.	282.
255.	231.	209.	189.	171.	155.	140.	127.	115.	104.
94.	85.	77.	70.	63.	57.				

END-OF-PERIOD FLOW

MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q	NO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q
0													

SUM 22.18 19.58 2.60 2185298.
(563.) (497.) (66.) (61880.75)

MFB 7/16/79

New Kernsville Dam
Hydrology / Hydraulics

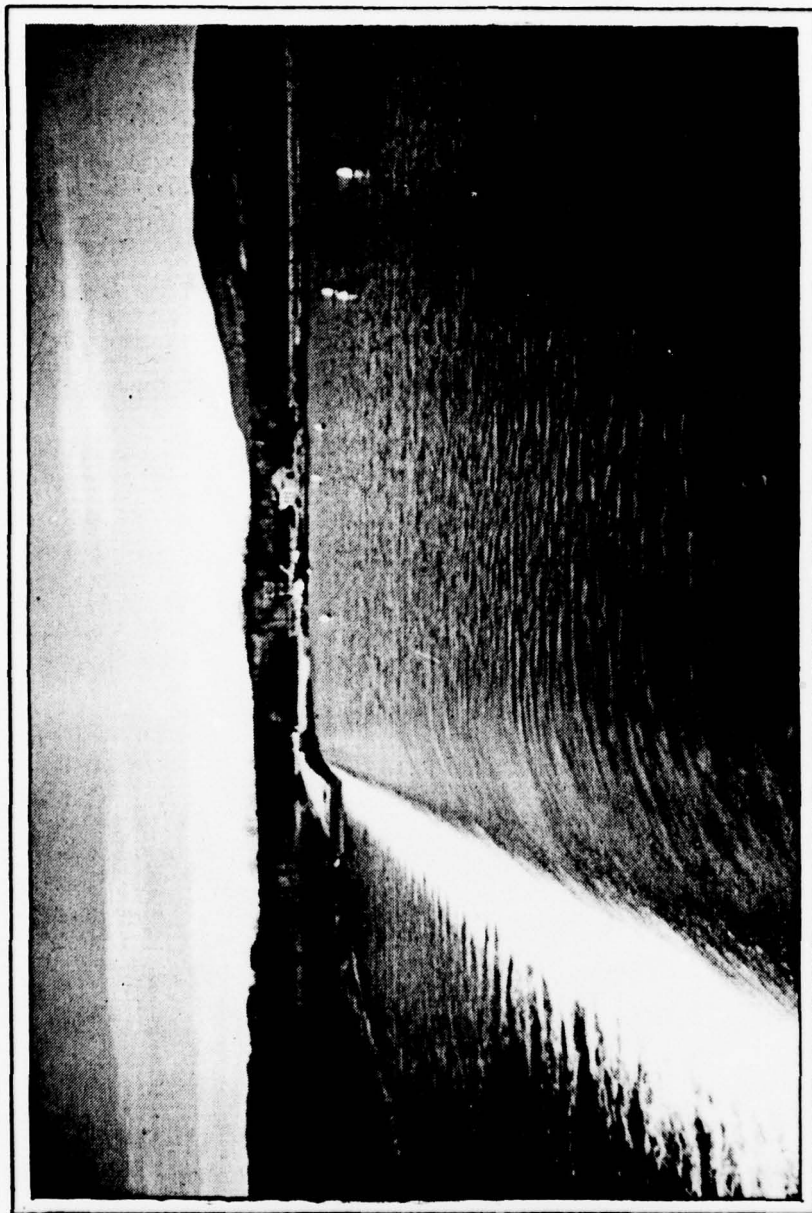
SH. 8 OF. 8

PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES (SQUARE KILOMETERS)

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO FLOWS			
				RATIO 1	RATIO 2	RATIO 3	RATIO 4
				.50	.80	.90	1.00
HYDROGRAPH AT	IN	340.00	1	70242.	112387.	126436.	140484.
	(880.60)	(1989.04)	(3182.46)	(3580.27)	(3978.07)

APPENDIX

D



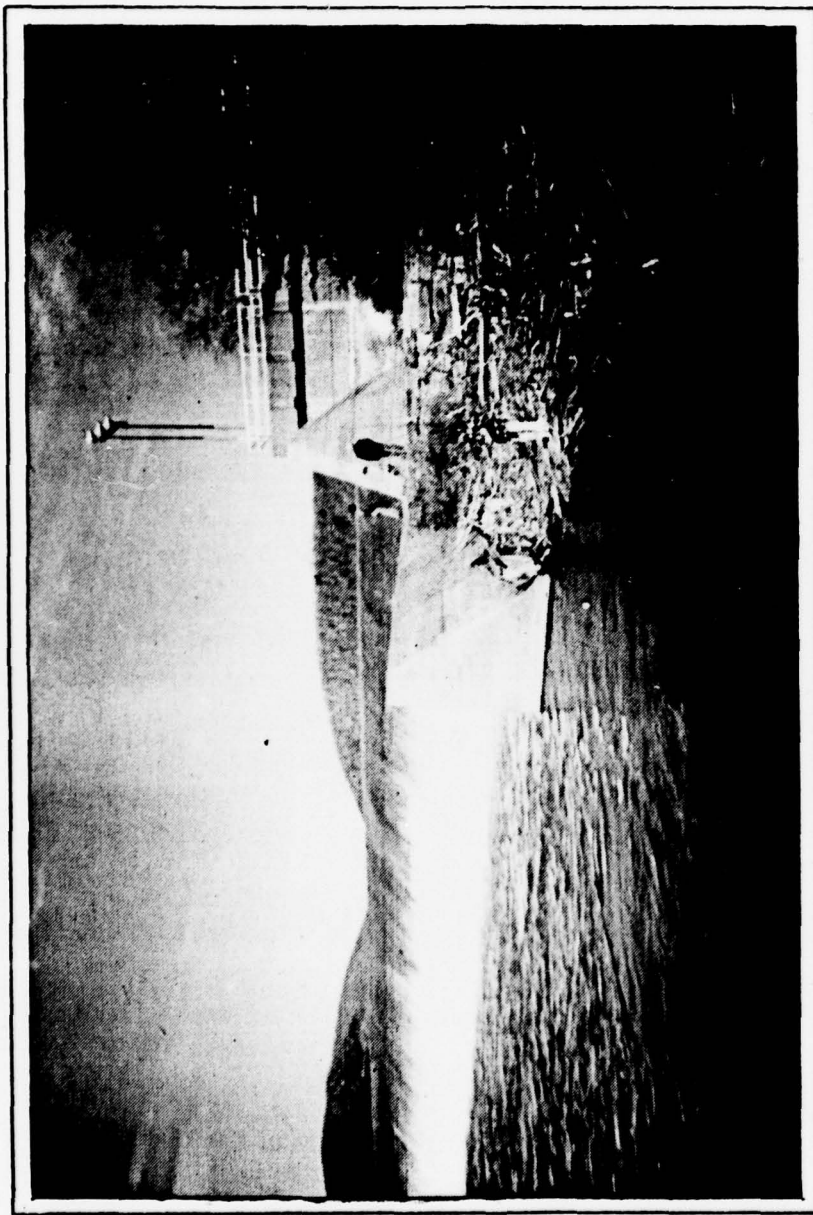
OVERVIEW OF SPILLWAY LOOKING FROM
LEFT ABUTMENT TOWARDS RIGHT ABUTMENT.

PHOTOGRAPH NO. 1



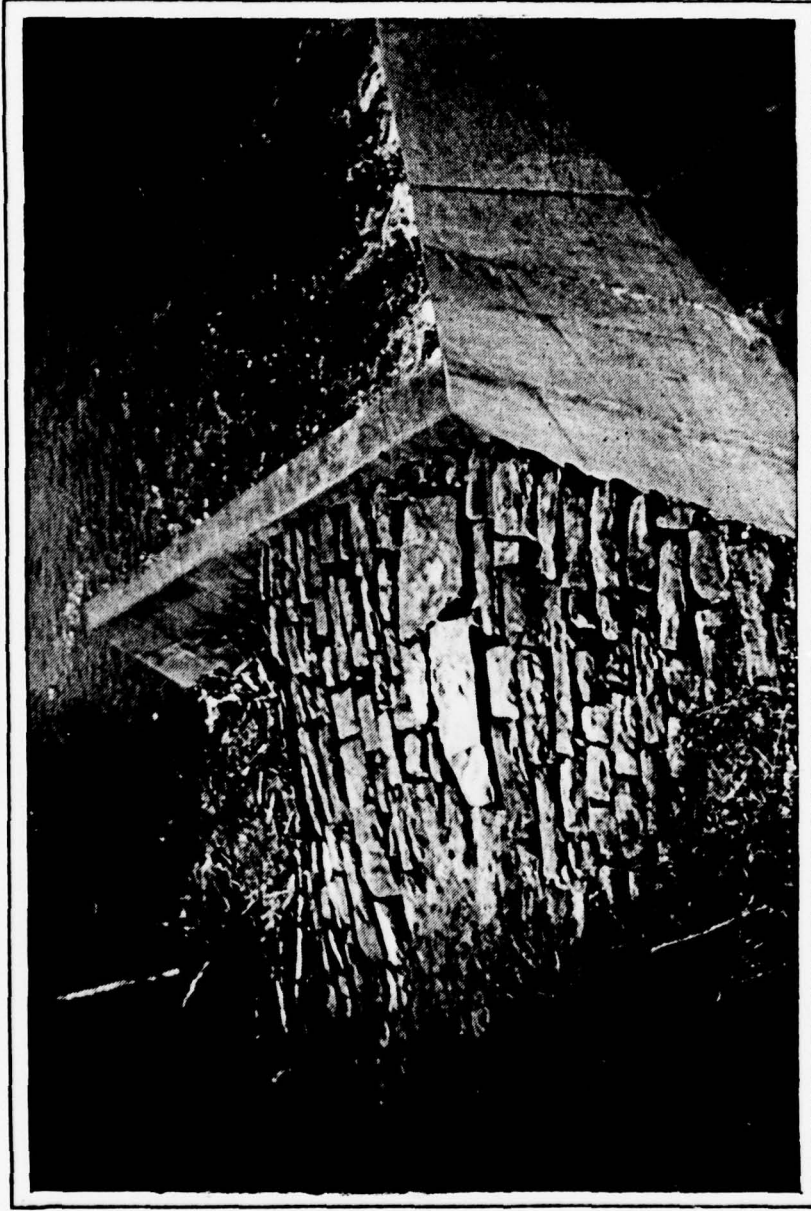
OBSERVATION PLATFORM ON LEFT SIDE
OF RIVER. NOTE SPALLED CONCRETE
SURFACE OF WALKWAY.

PHOTOGRAPH NO. 2



VIEW OF LEFT ABUTMENT LOOKING UPSTREAM.
NOTE DEBRIS ON INSIDE OF ABUTMENT.

PHOTOGRAPH NO. 3



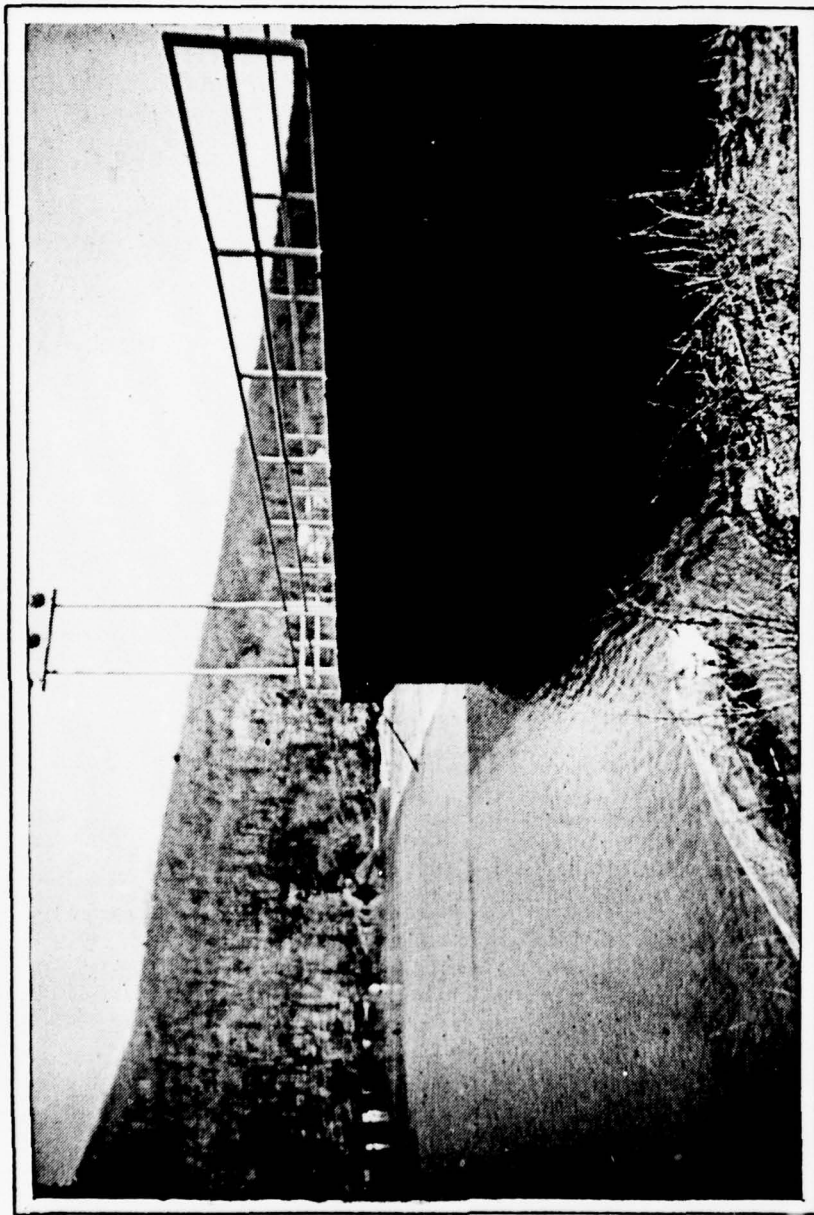
OVERVIEW OF LEFT ABUTMENT FROM
OBSERVATION PLATFORM LOOKING
DOWNSTREAM

PHOTOGRAPH NO. 4



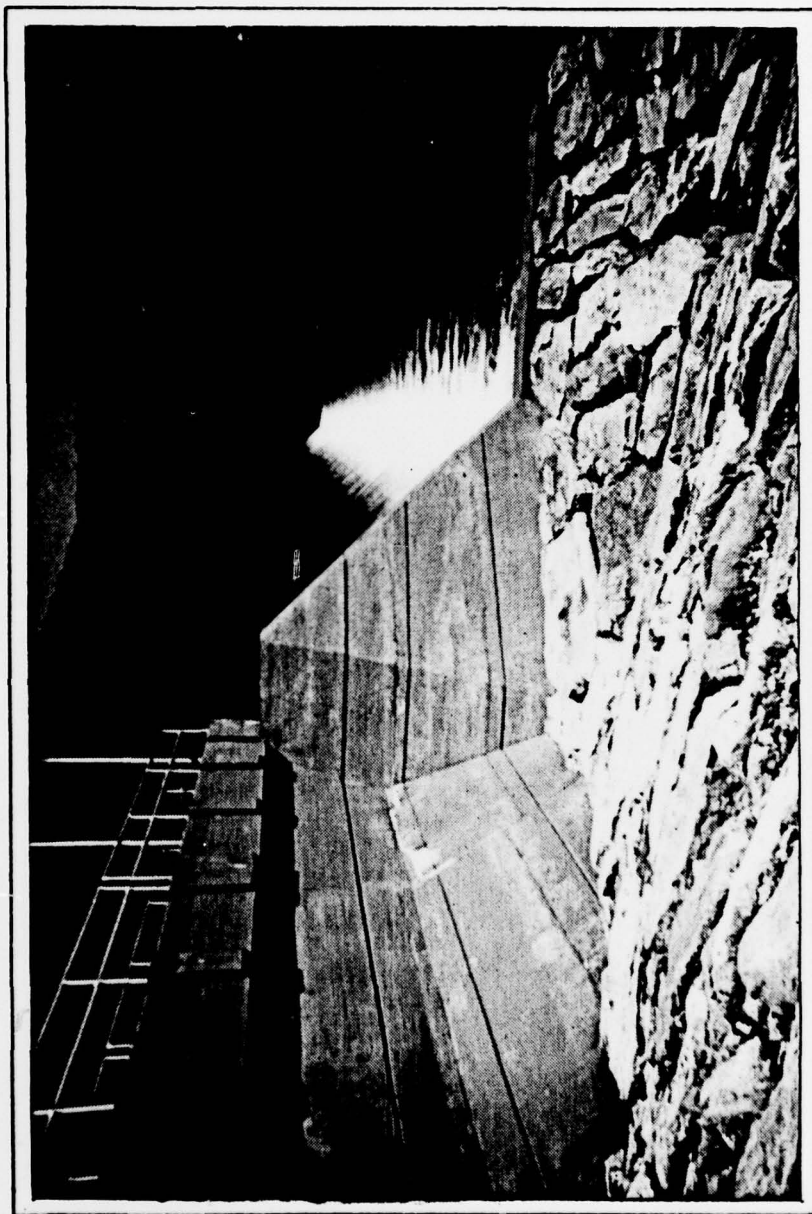
OVERVIEW OF LEFT ABUTMENT.

PHOTOGRAPH NO. 5



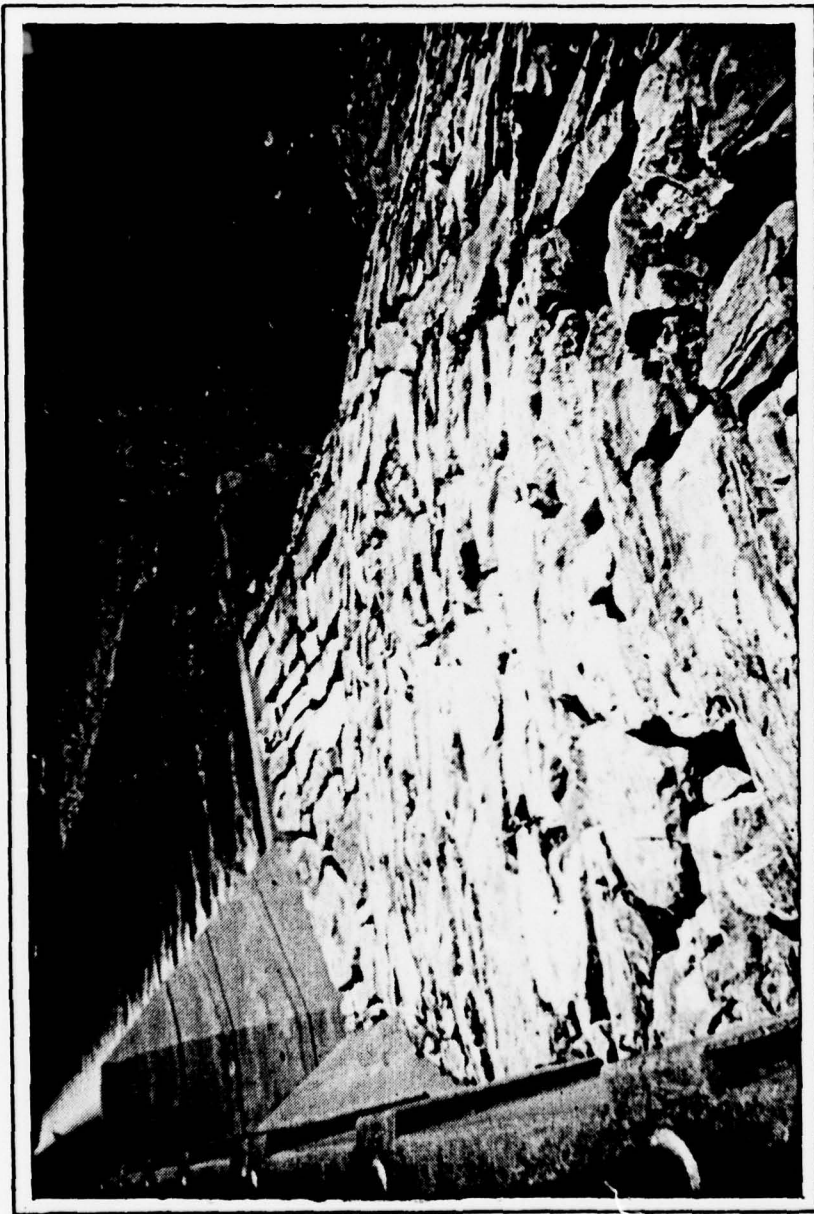
OVERVIEW OF RIGHT ABUTMENT FROM THE
UPSTREAM SIDE.

PHOTOGRAPH NO. 6



OVERVIEW OF RIGHT ABUTMENT ON THE
DOWNSTREAM SIDE LOOKING TOWARDS
LEFT ABUTMENT.

PHOTOGRAPH NO. 7



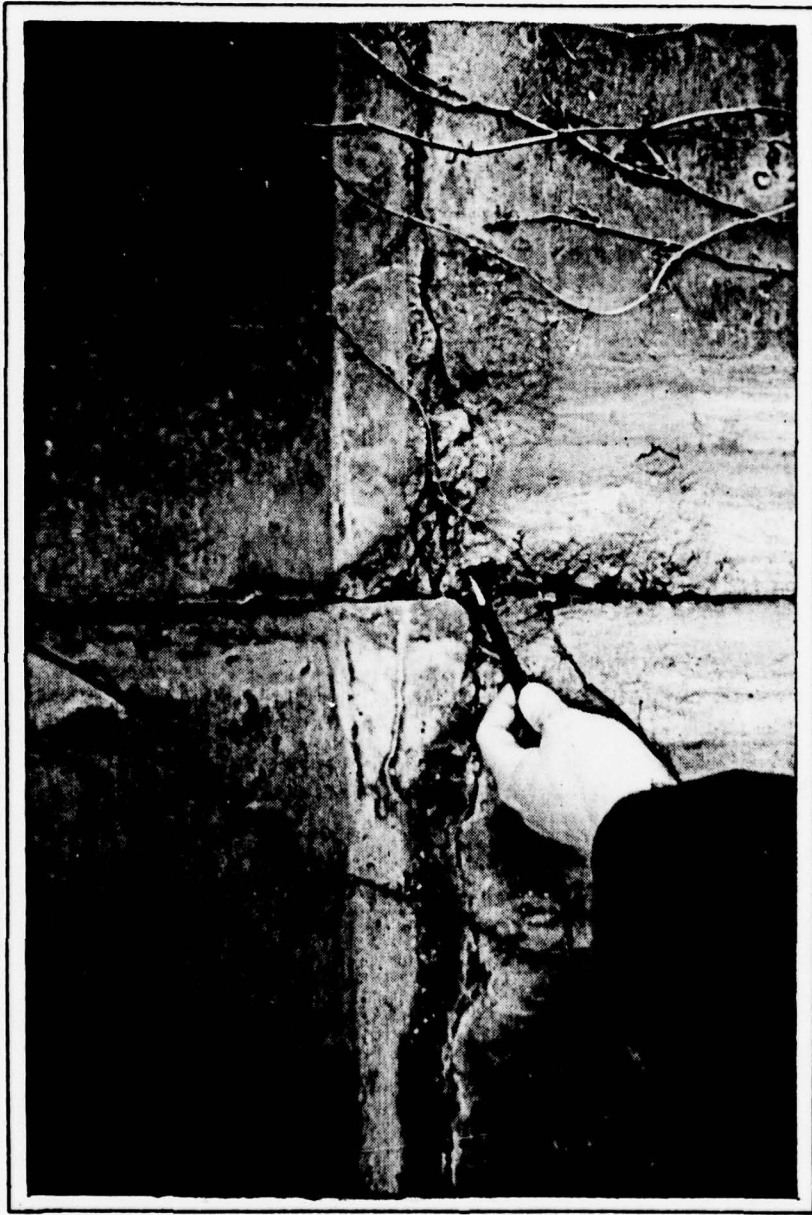
DOWNSTREAM OVERVIEW OF RIGHT ABUTMENT
AND RIPRAP.

PHOTOGRAPH NO. 8



TYPICAL CONSTRUCTION JOINT OF THE
ABUTMENTS.

PHOTOGRAPH NO. 9



TYPICAL CONDITION OF ABUTMENT
CONSTRUCTION JOINTS.

PHOTOGRAPH NO. 10

APPENDIX

E

DAM SITE

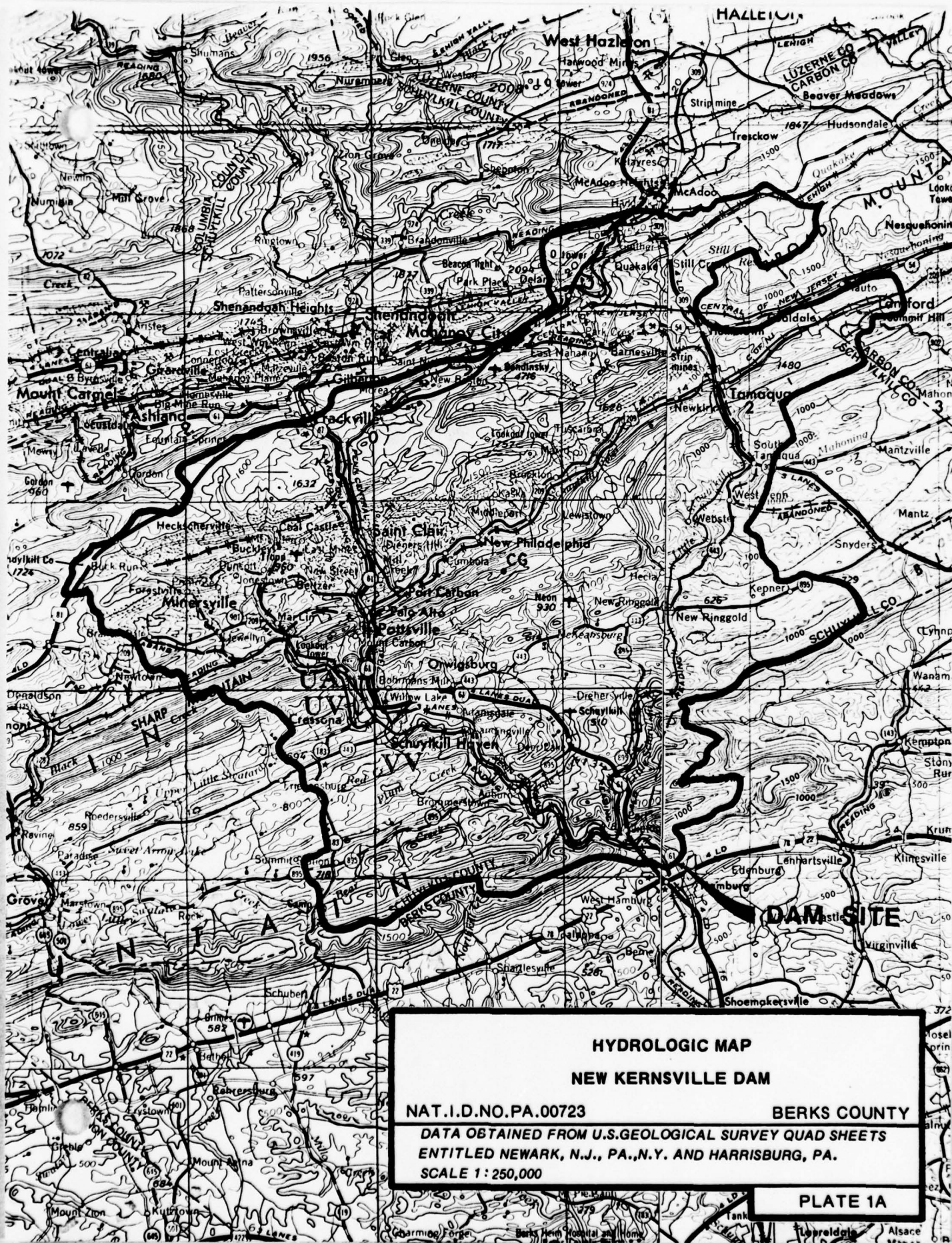
**REGIONAL LOCATION PLAN
NEW KERNSVILLE DAM**

NAT.I.D.NO.PA.00723

BERKS COUNTY

DATA OBTAINED FROM U.S. GEOLOGICAL SURVEY
MAPS ENTITLED AUBURN AND HAMBURG, PA.

PLATE 1



HYDROLOGIC MAP

NEW KERNSVILLE DAM

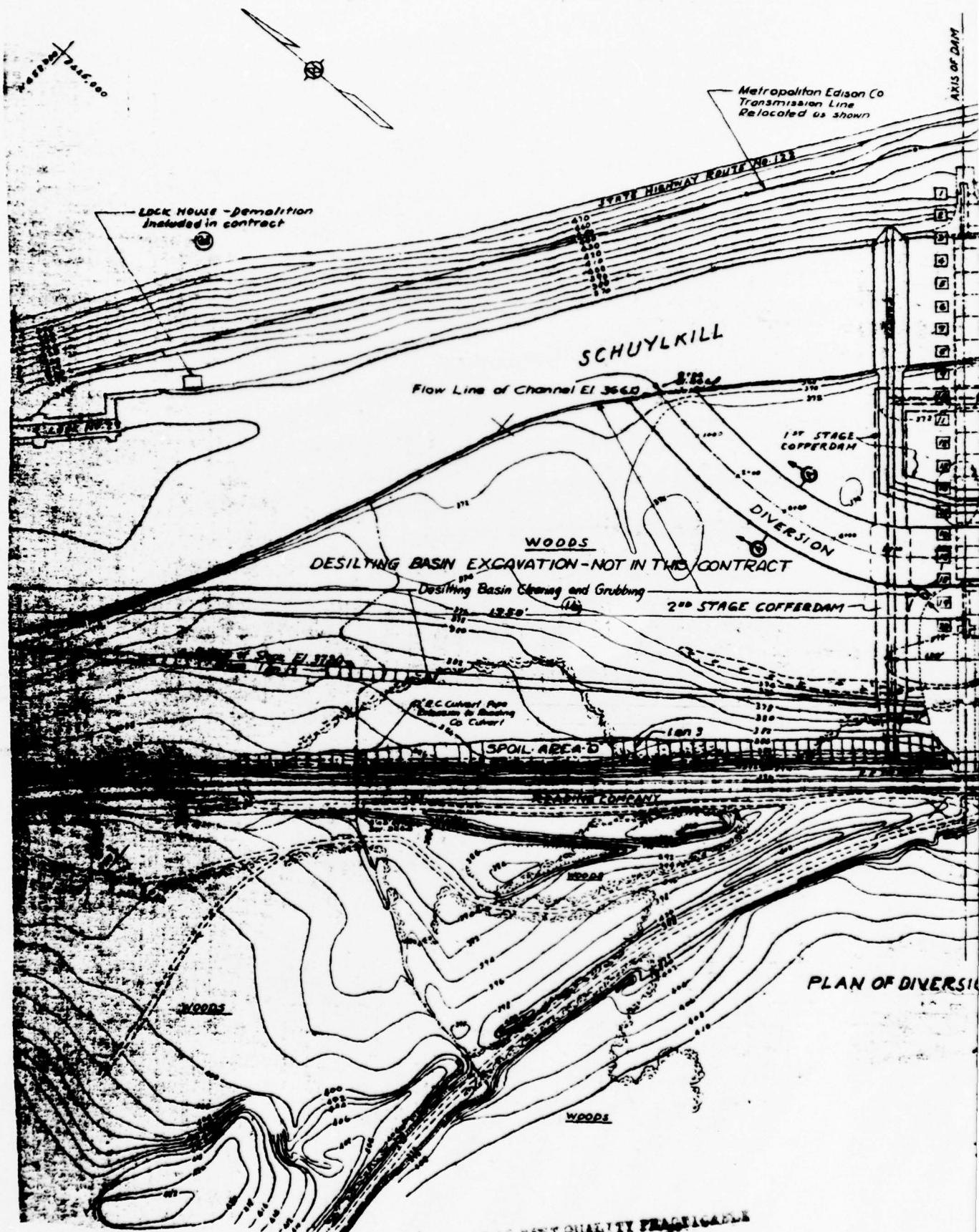
NAT.I.D.NO.PA.00723

BERKS COUNTY

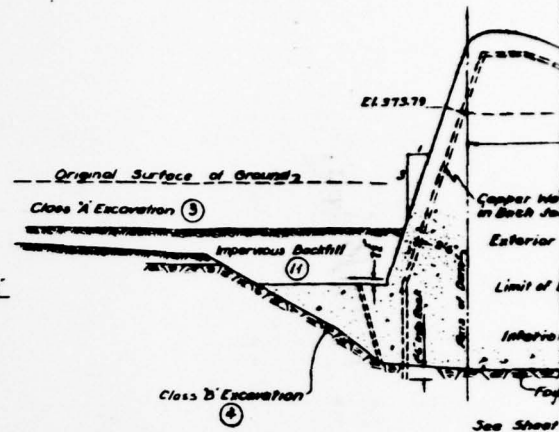
DATA OBTAINED FROM U.S.GEOLOGICAL SURVEY QUAD SHEETS
ENTITLED NEWARK, N.J., PA., N.Y. AND HARRISBURG, PA.

SCALE 1:250,000

PLATE 1A

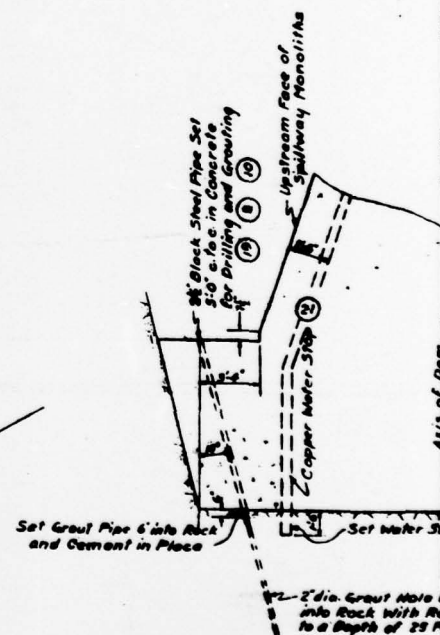
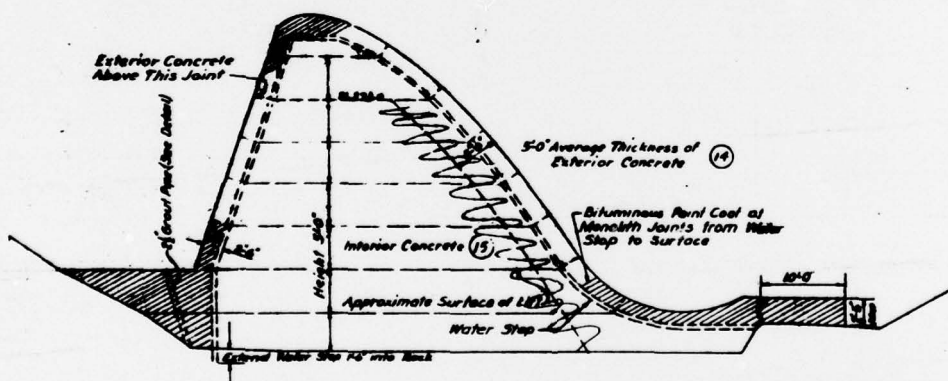


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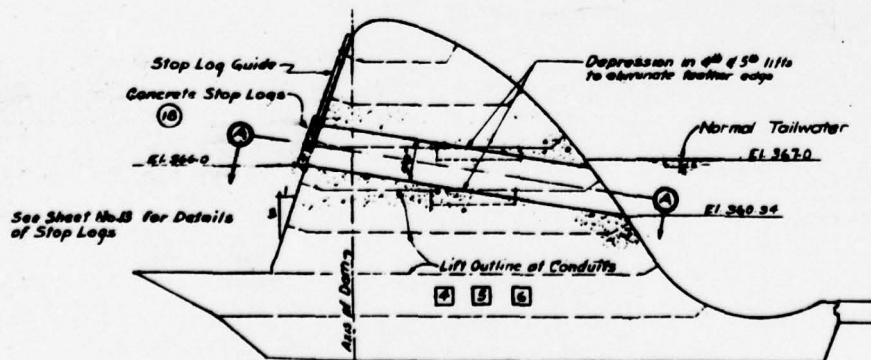


DETAIL OF SPILLWAY OUTLINE

SPILLWAY



SPILLWAY CONSTRUCTION DETAILS

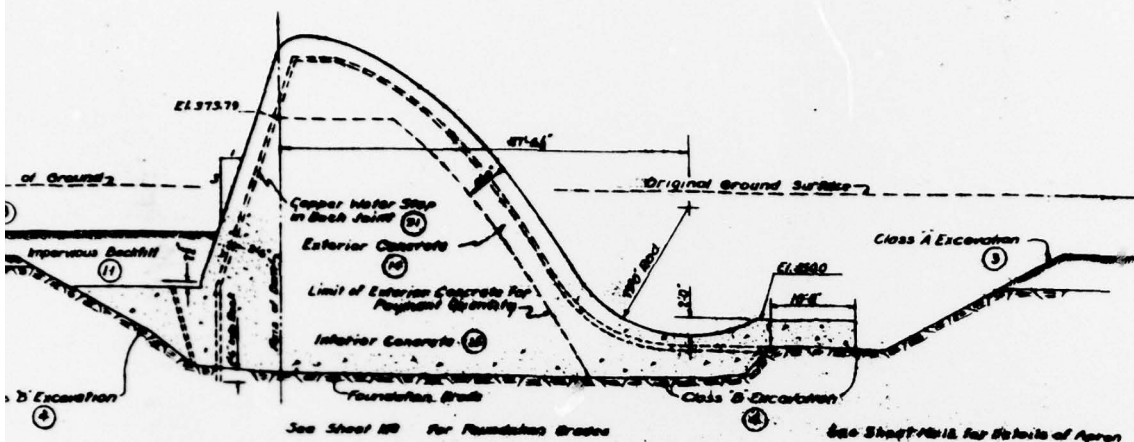


DETAIL OF GROUT PIPE

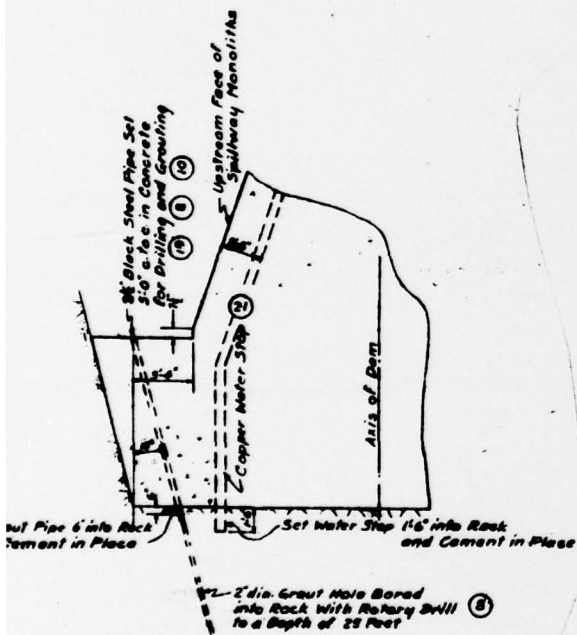


SECTION A-A

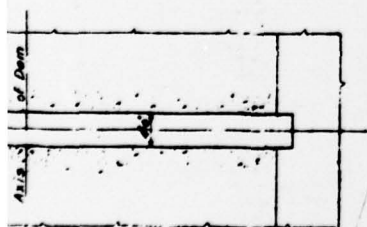
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SPILLWAY CONSTRUCTION DETAILS



DETAIL OF GROUT PIPE SETTING



SECTION A-A

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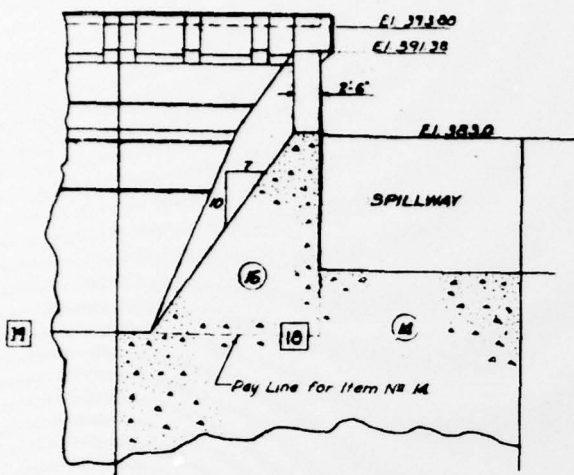
OVERFLOW SECTION NEW KERNSVILLE DAM

NAT. I.D. NO. PA. 00723

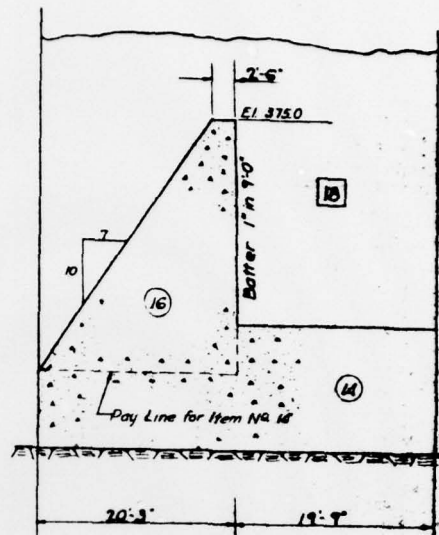
BERKS COUNTY

DATA OBTAINED FROM BUREAU OF COMPLETED PROJECTS,
SCHUYLKILL RIVER OFFICE, CONTRACT NO. 10 SHEET NO.
6, DATED 12/29/60

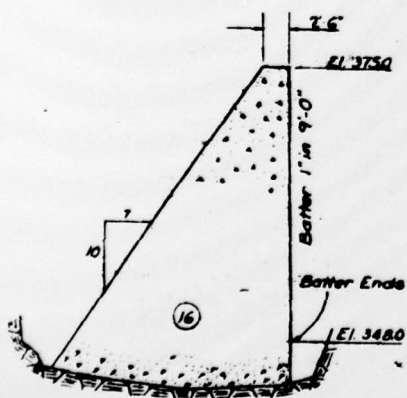
PLATE 3



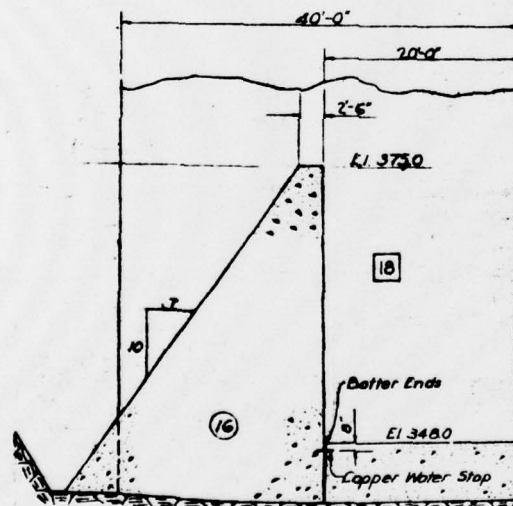
SECTION E-E



SECTION D-D



SECTION B-B



SECTION C-C

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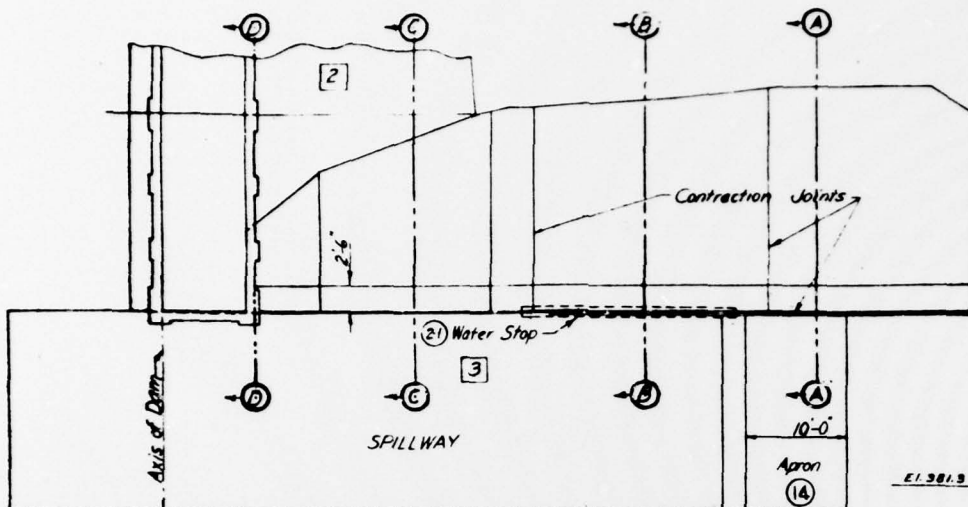
**RIGHT SPRAY WALL
NEW KERNSVILLE DAM**

NAT. I.D. NO. PA.00723

BERKS COUNTY

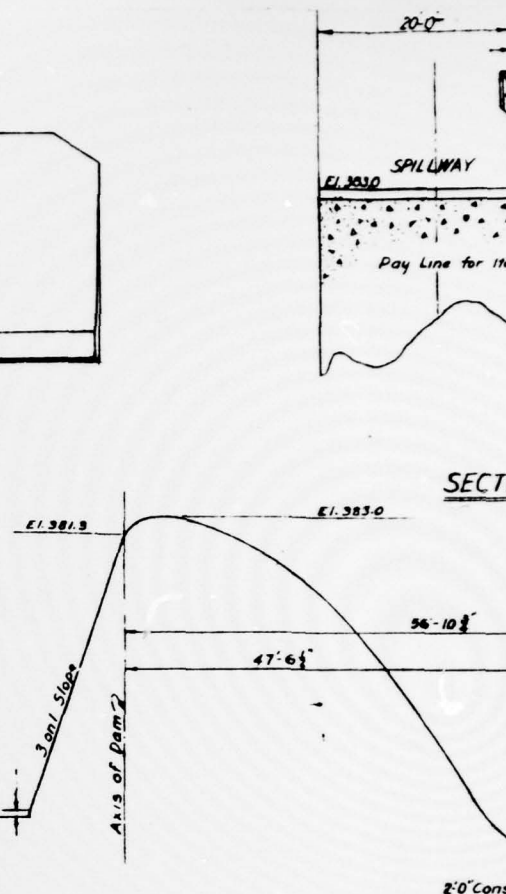
DATA OBTAINED FROM BUREAU OF COMPLETED PROJECTS,
SCHUYLKILL RIVER OFFICE, CONTRACT NO. 10 SHEET NO.
14, DATED 12/29/50

PLATE 4

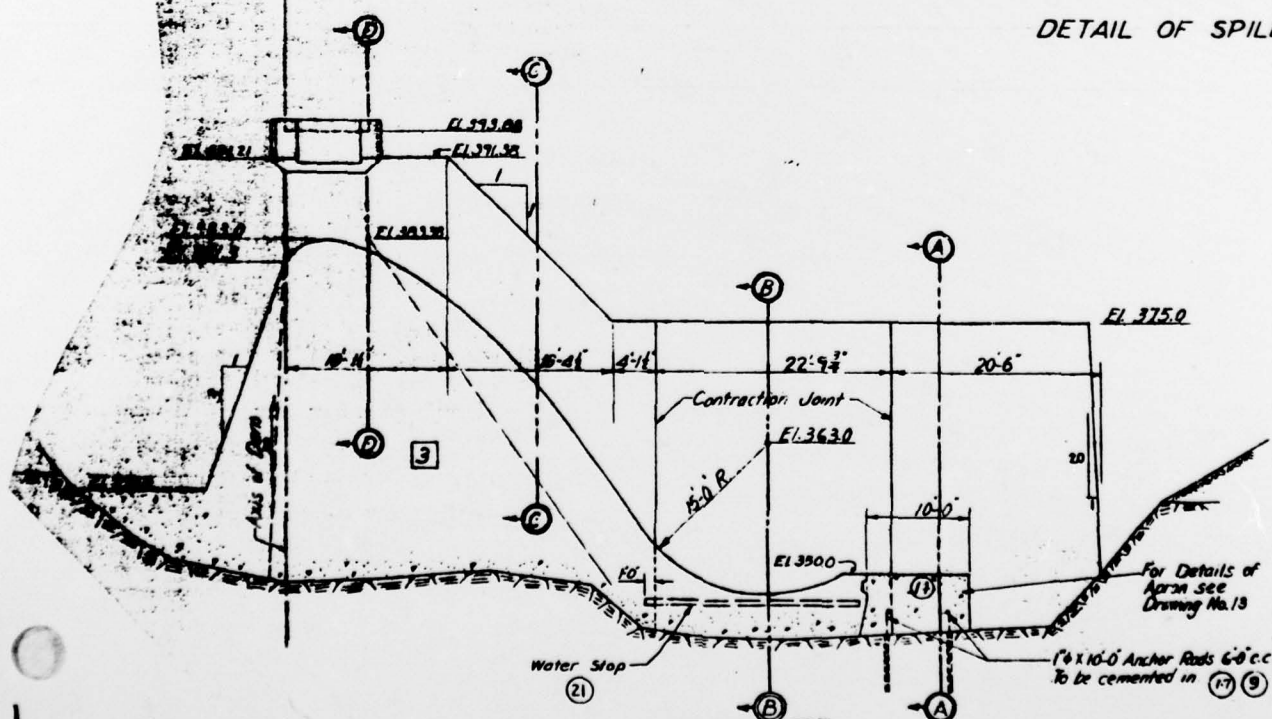


PLAN OF LEFT SPRAY WALL

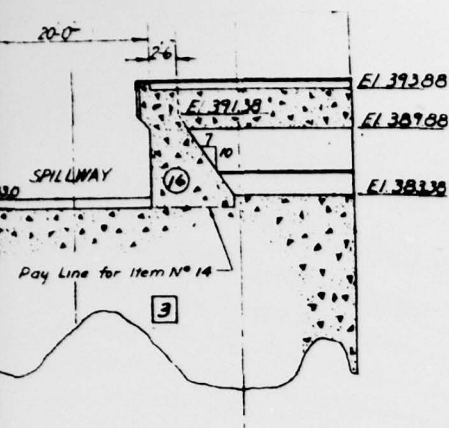
For elevation see individual sections



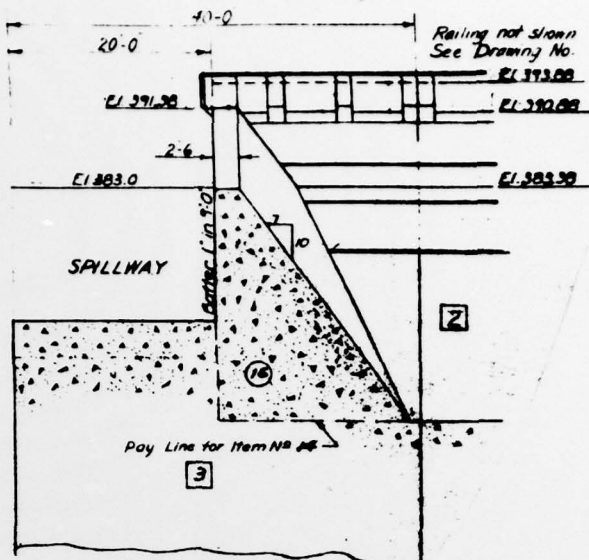
DETAIL OF SPILLWAY OUTLINE



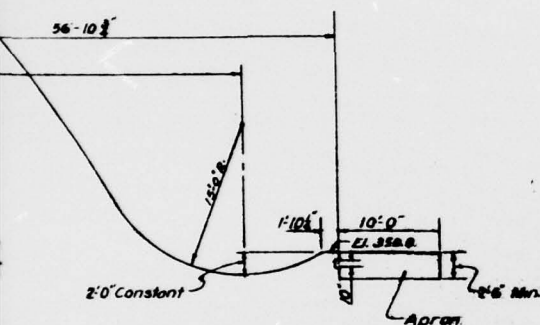
ST QUALITY FRAGILE
SHED TO DDG
ELEVATION OF LEFT SPRAY WALL



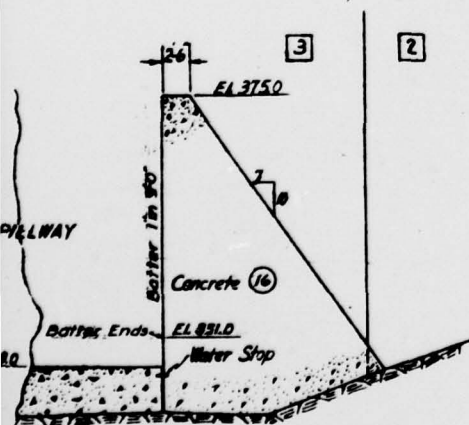
SECTION D-D



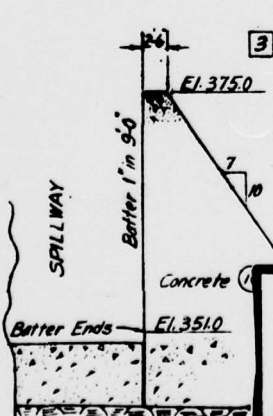
SECTION C-C



OUTLINE



SECTION B-B



SECTION A-A

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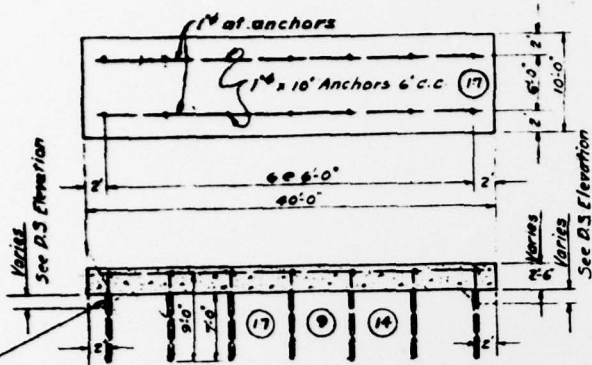
LEFT SPRAY WALL
NEW KERNSVILLE DAM

NAT.I.D.NO.PA.00723

BERKS COUNTY

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15, DATED 12/29/50

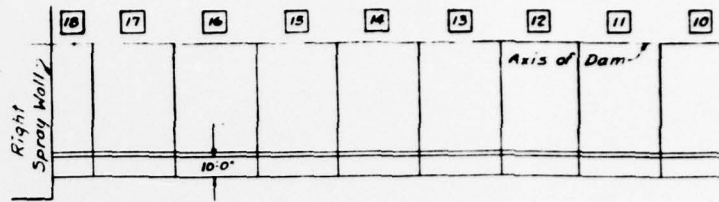
PLATE 5



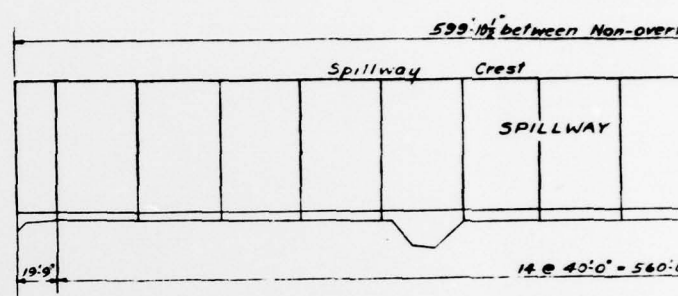
Concrete filllets to be placed as indicated on Downstream Elevation.

1 1/2" x 10'-0" Anchors 6'-0" c.c. Holes shall be drilled 3 1/2" dia. to required depth and anchors cemented in.

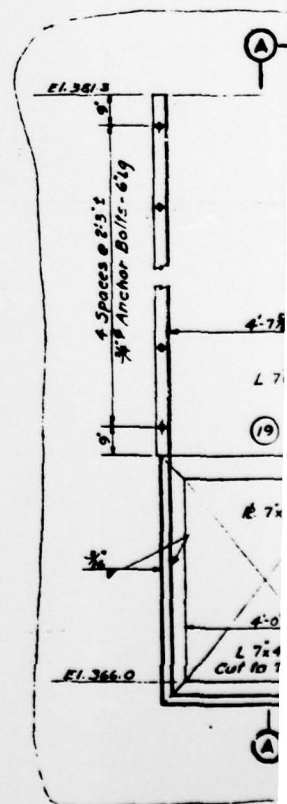
DETAIL OF APRON SLAB



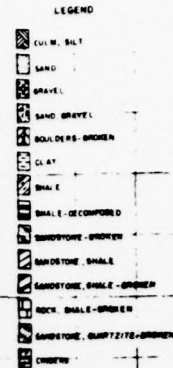
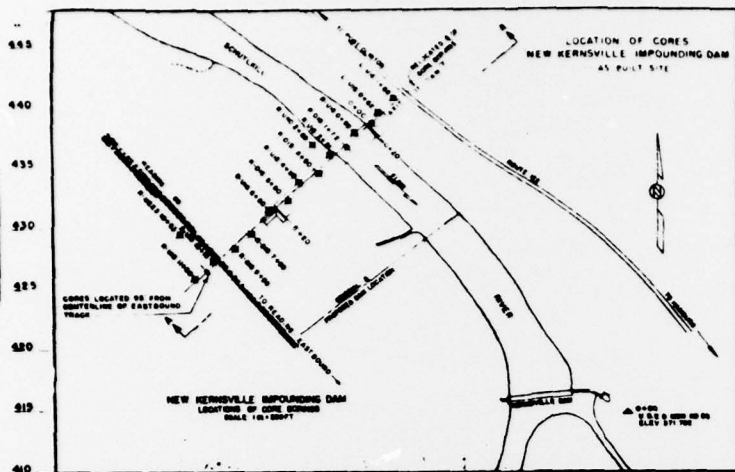
PLAN OF CONCRETE



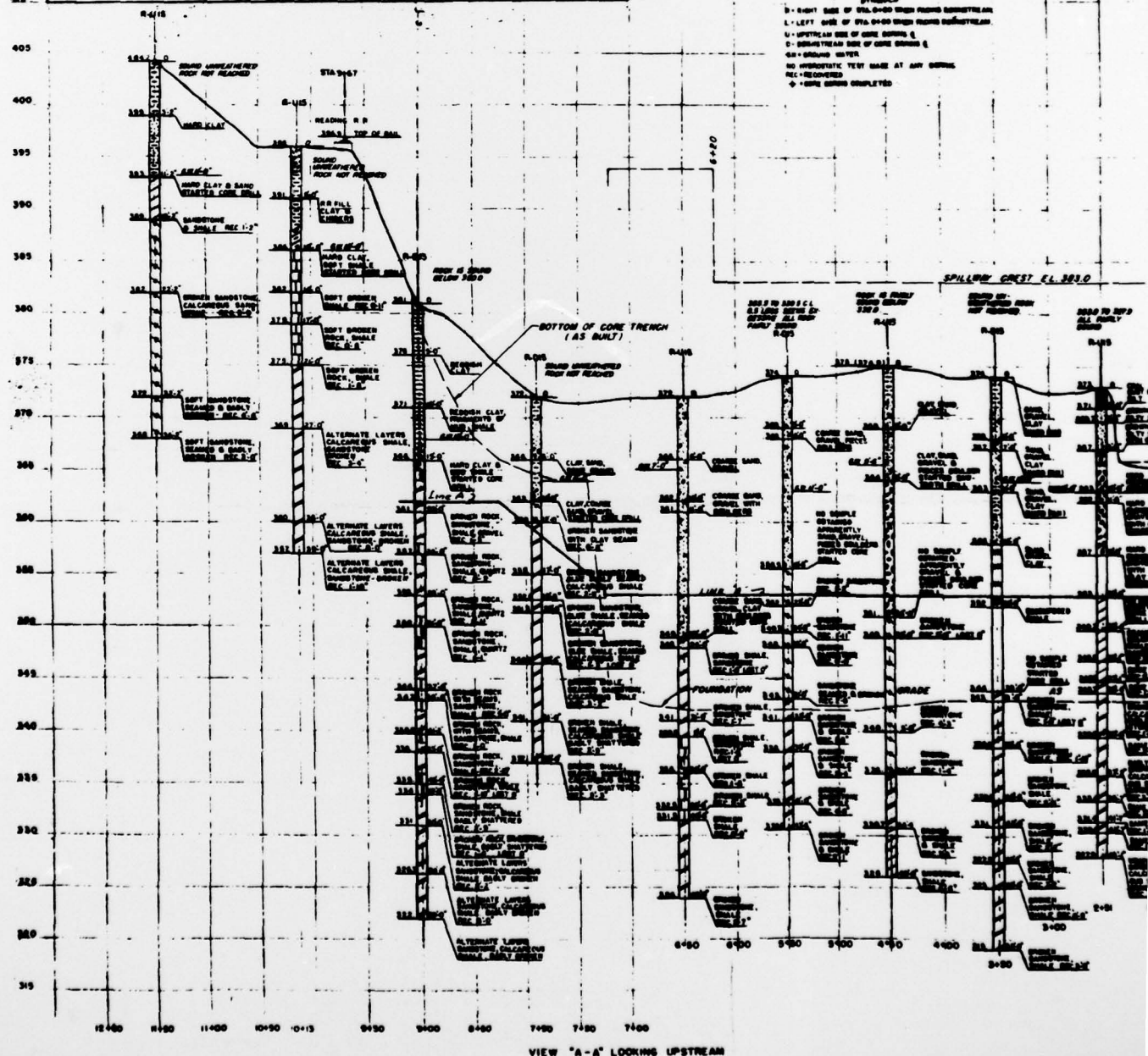
DOWNSTREAM E



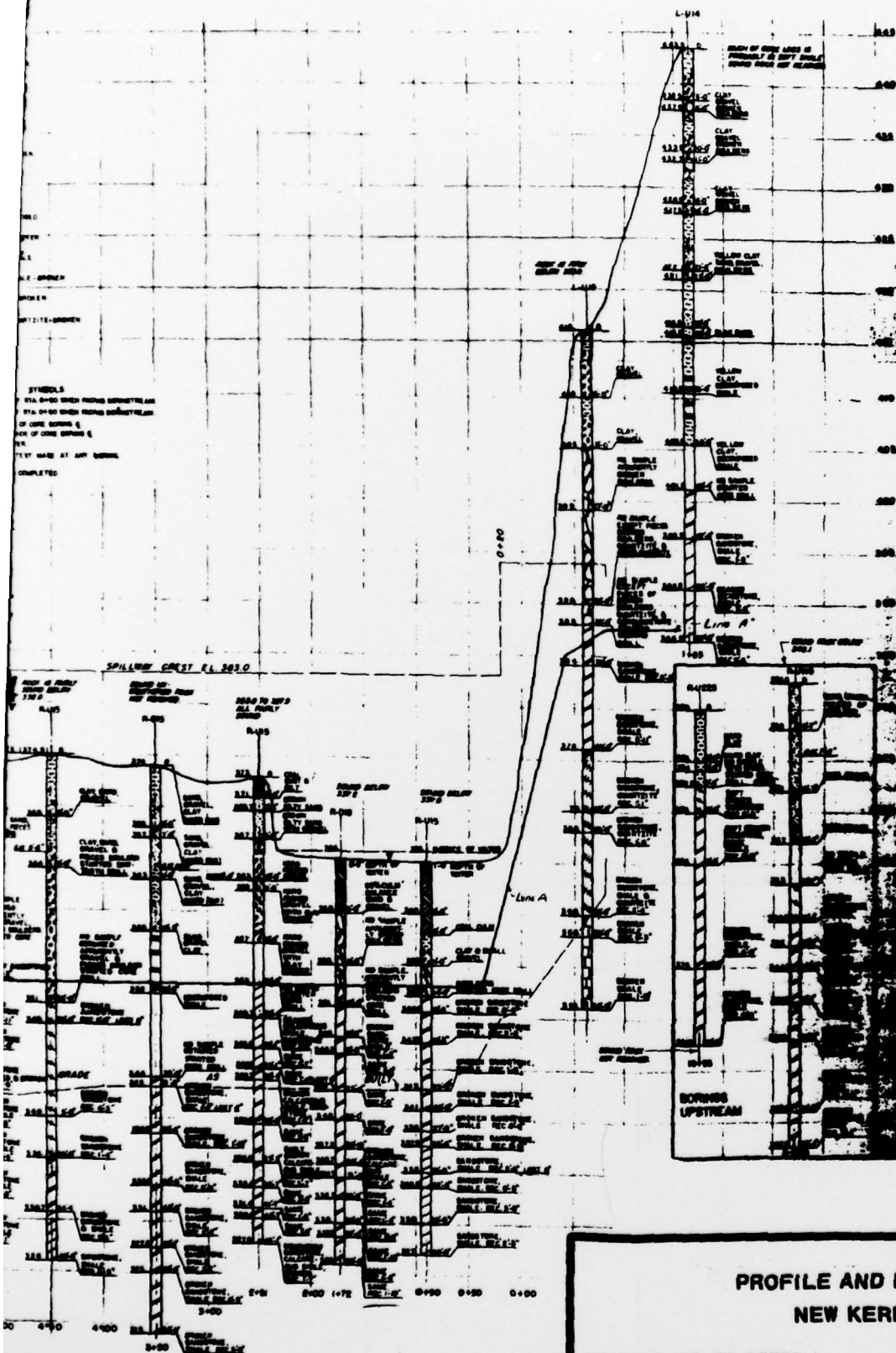
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SYMBOLS
 S - RIGHT SIDE OF TRENCH FROM STREAM
 L - LEFT SIDE OF TRENCH FROM STREAM
 U - UPSTREAM SIDE OF CORE BORING
 D - DOWNSTREAM SIDE OF CORE BORING
 G - GROUND WATER
 NO HYDROSTATIC TEST MADE AT ANY BORING
 RE - RECOVERED
 * - CORE BORING COMPLETED



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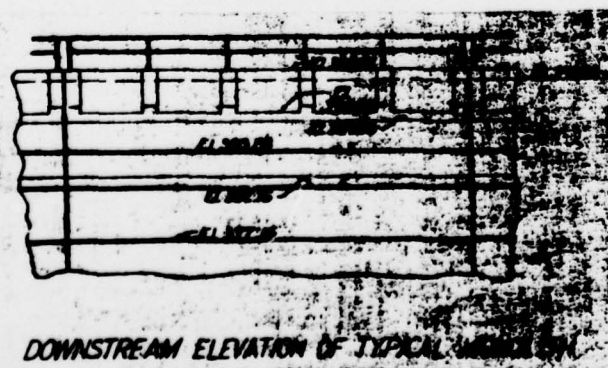
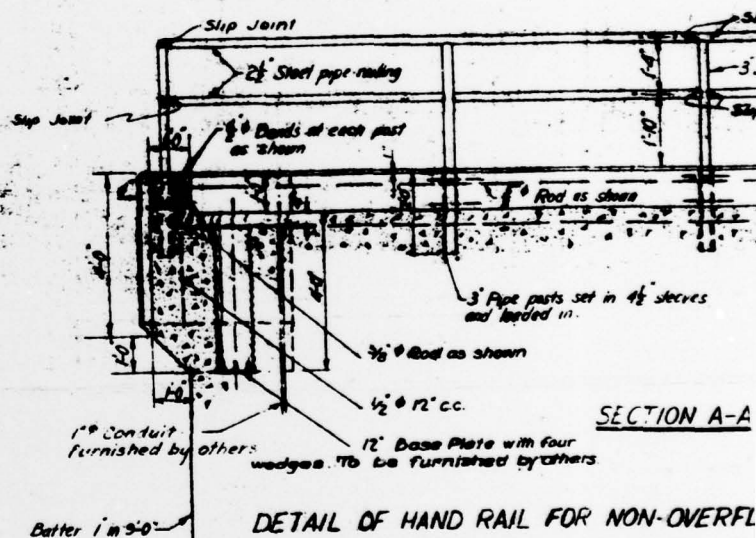
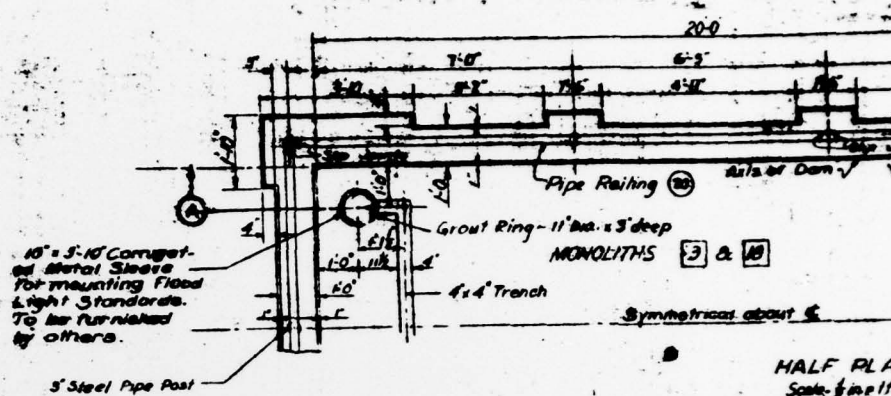
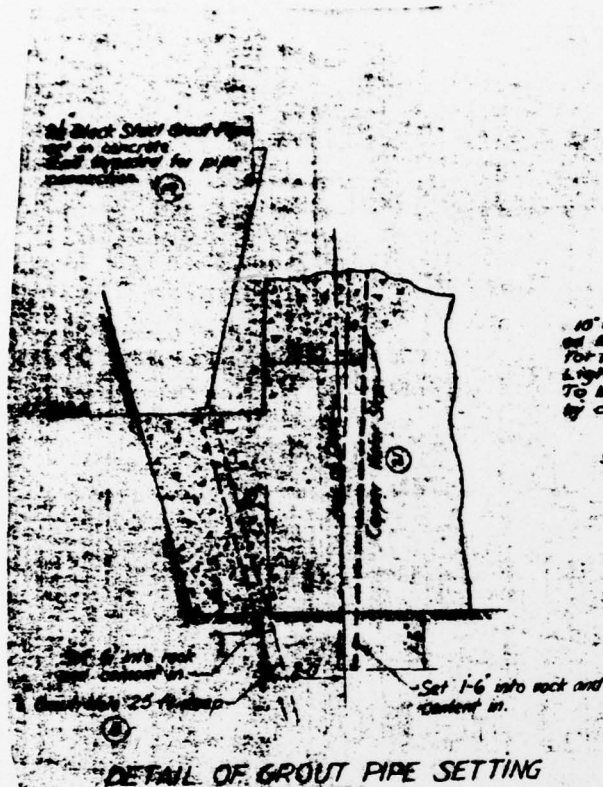
**PROFILE AND LOG OF BORINGS
NEW KERNSVILLE DAM**

NAT.I.D.NO.PA.00723

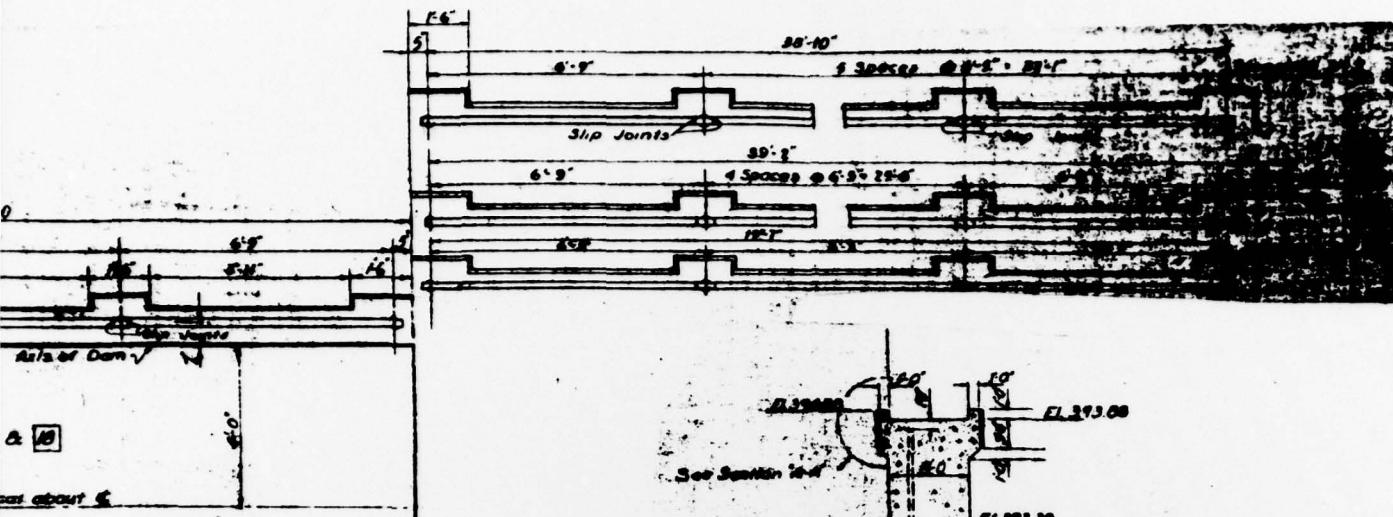
BERKS COUNTY

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SCHUYLKILL RIVER OFFICE, CONTRACT NO. 10 SHEET
NO. 2, DATED 12/29/50

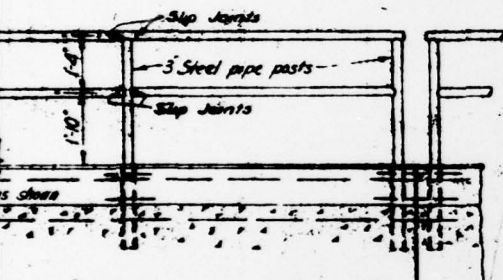
PLATE 7



DETAIL OF FRUSTICA
AT HORIZONTAL CONSTRUCTIO

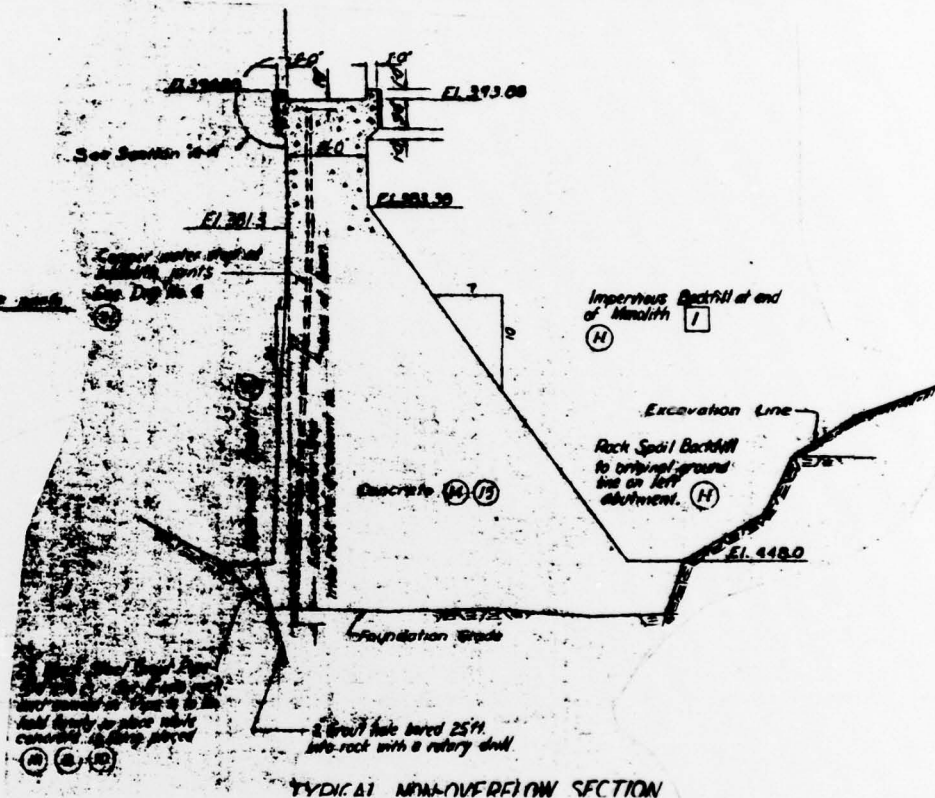


HALF PLAN
Scale 1/4" = 1'-0"



SECTION A-A

NON-OVERFLOW MONOLITHS



TYPICAL NON-OVERFLOW SECTION

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DETAILS OF NON-OVERFLOW SECTIONS NEW KERNSVILLE DAM

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BERKS COUNTY

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SCHUYLKILL RIVER OFFICE, CONTRACT NO. 10, SHEET
NO. 7, DATED 12/29/50

PLATE 8

2

APPENDIX

F

SITE GEOLOGY
NEW KERNSVILLE DAM

New Kernsville Dam is located along the boundary between the Appalachian Mountain Section and the Great Valley Section of the Valley and Ridge Physiographic Province. As shown on Plate F-1, the bedrock underlying the dam site area consists of the Martinsburg Formation of Ordovician age. The predominant rock type is gray shale having sandstone interbeds. The regional bedrock strike is to the northeast with beds dipping to the northwest (upstream direction). No bedrock exposures were in the immediate dam site area during the field investigation. The boulder riprap on each abutment was, most likely, quarried partly from the conglomerate and sandstone beds of the nearby Shawangunk Formation.

